Food Manufacture

Incorporating Canning, Packing, and Preserving

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Nazified Nature.

"TO THE solid ground of Nature trusts the mind that builds for aye" is the motto of the weekly organ of the world of science, *Nature*, and most will admit that its claim to solidity, dignity, and accuracy has been consistently maintained during its highly respectable life of 3,315 or so issues. We, ourselves, are a pretty constant reader of the journal and take pride in being numbered among its admirers.

It was therefore with some feeling of surprise that on April 29 we opened our copy of *Nature* to find a little over two pages occupied by a piece of journalism which would have done justice to the yellow press at its worst. We turned back to the cover to make sure that we were in the right journal, so to speak, and having satisfied ourselves on that point, wondered if our good friend *Nature* was becoming nazified or, possibly, jazzified, in its old age; otherwise, how is one to explain these two pages of paraphasia, from which we take the following sample?

Food in "Coffins."

"'Nought shall make us rue
If England to itself do rest but true.'

"We take our time in minding the Bastard's advice—concerning ourselves more with Far Eastern questions than with our own, even with such minor, polar moments as hard hitting above the cricket belt and dog totes. In fact, our one popular use of our land is playing games upon it: also as gladiators but upon rubber tyres and oil-fouling our tracks as we go, mercilessly and without turning down of thumbs running each other down, under sanction of third party insurance! Those who set themselves over us, by right of caucus, have long ceased to think of the land in constructive, sympathetic terms or otherwise than as affording opportunity for the greatest of all games—taxation! Agricultural research is become an underground business, with little interest in sun-bathing; dealing with bacteria mostly—a form of life to which, ultimately, we must all succumb. In Egyptian times, some care was taken of our bodies—to-day we are simply handing them over to commercial exploitation: to universal undertakers called canners. *We calmly cut our food not from the joint with two vegetables but out of sealed 'coffins.'* Fresh food will soon be unseen and unsold! Health must steadily deteriorate. We call the game we are fatuously playing—Progress; perchance, the name will ere long perforce be changed to Perdition."

Back to Nature.

Is this Nature gone mad? What does it mean? Can anyone, even a chemist, extract an atom of sense out of it? Let's see! The first of April is past and May Week at Cambridge is yet to come. Magnetic storms, sun spots, full moon, jaundice, roast pork—of course, it is roast pork! How stupid to have overlooked the author; we must look at the article again. Why, it's Professor H. E. Armstrong, F.R.S.! If the learned Professor will eat roast pork and jeer at canned foods, what is one to expect? Even his digestion, which we have previously likened to a combined flat-stone mill and mash-tun, will not stand up to this sort of thing. If the Professor really wishes to get back to Nature, why not go the whole hog? Why cook the ox or grind the corn at all? It is quite a simple matter and would get over that annoyance of the can opener.

The Anglo-Danish Agreement.

On April 26 the text of the Anglo-Danish agreement—the first to be made with a foreign country since Ottawa—

was published. By it the Danish allocation for bacon and ham is not to be less than 62 per cent. of the total permitted imports for foreign countries, and for three years (the length of the agreement) there will be no British tariff on bacon. The allocation of eggs is not less than 5½ million great hundreds in any year. In regard to butter, the tax of 15s. per cwt. still remains, but if a quota is established Denmark will be allowed to send us not less than 2,300,000 cwt. in any year, or more if the total imports of butter are allowed to exceed 8,100,000 cwt. The Danish duty is to be abolished in many cases and reduced in others, such as marmalade, jam, pickles, biscuits, and cakes. There will be no regulation of the import of dried fish, salmon, sea trout, or fresh water fish of Danish taking, and her allocation for other kinds is not less than 412,000 cwt. in any year, the 10 per cent. *ad valorem* duty remaining.

Commenting on the text of the agreement, *The Times* states that "the pessimistic outlook adopted by a number of egg producers during the Anglo-Danish negotiations has been modified since the terms of the agreement were published. The belief that producers were to be sacrificed in the interest of other industries is not justified by the text of the agreement which, indeed, has served to increase confidence in the possibilities of marketing organisation under the conditions embodied in the new Marketing Bill." Of course, the ultimate effect of the proposed quota systems with Denmark and the Argentine on the prosperity of British agriculture will depend largely on the success of the new Marketing Bill. It must be admitted that this is a great experiment, but the Ministry of Agriculture has faith in it. The farmer naturally would prefer direct protection by the imposition of prohibitive tariffs, but he must remember that there is a consumer's point of view as well, and it is the Government's job to see both points and steer a middle course.

Trade Returns.

The Board of Trade returns for the first quarter of 1933 show substantial reductions in the imports of both bacon and eggs, a fact that should give satisfaction to home producers of these commodities. There has been a reduction of 16 per cent. in the amount of eggs imported in the shell and a decline of 20 per cent. in importation of bacon. As it is not likely that the consumption of these articles has fallen to such an extent, it seems evident that the home producer must be getting a bigger share of the market. There has been a very big fall in the import of potatoes and a slight drop in condensed milk. On the other hand, the imports of butter have increased still further and there is no sign of a drop in the case of cheese. If the milk marketing scheme is put into action there is little doubt but that measures will be taken to increase the price level of manufactured milk products. By the Anglo-Danish agreement Denmark has now been given a share in our market for bacon, butter, and eggs, with the promise that tariffs shall not be put on her products, but the British Government reserves the power to regulate the quantity of imports in order to secure the effective operation of marketing schemes at home.

New Canning Developments.

A recent development in the canning industry in Australia is the packing of oysters both in cans and bottles at Pindimar, Port Stephens, New South Wales. The factory only started operations in the latter half of 1932 but has already treated about 2 million oysters. It will be remembered that Pindimar was the scene of the ill-fated trawling industry of New South Wales over which the Government lost large sums. Some of the premises and idle machinery and plant of the State trawling undertaking has now been taken over by a private concern, which is canning oysters and is shortly to be marketing canned butterfish. The butterfish is celebrated for its sweetness, and it is found in great quantities in the estuaries of New South Wales.

Coming nearer home we hear of a proposal to establish a fruit canning factory at Wrexham. This will undoubtedly be of great interest to the Dee Valley fruit growers. The late Cheshire strawberry—famous and much sought after for jam making—should make an ideal pack. In Devonshire the canning of mushrooms is in progress and farmers there are hiring caves for the cultivation of the spawn. At Nuneaton in Warwickshire a factory is contemplated to deal with pork, beef, chickens, hens, geese, game, eggs, milk, veal, French beans, carrots, spinach, turnips, artichokes, sprouts, cauliflowers, and garlic.

There is also a revival in turtle canning activities at Cessack in North-Western Australia.

Sugar Beet.

The question of the Government's future policy in regard to sugar beet received considerable ventilation in the recent debate on the Budget. Sir H. Samuel stated that in the Budget speech last year the Chancellor of the Exchequer proposed to appoint a committee to enquire into the whole subject before any new financial arrangement was made, but pointed out that nothing further had been heard about the committee although a year had elapsed. Sir Herbert maintained that the taxpayer has provided already over £30,000,000 for this experiment, much of which, in his opinion, had been squandered.

He referred to a calculation that had been published and not challenged, that every day's work for every man

employed in the sugar beet industry, either in the factories or fields, has cost the taxpayer 25s. in the form of subsidy or rebate of taxation. Sir Herbert pleaded that the matter should be impartially, carefully, and searchingly examined by a committee before the House of Commons is asked to spend another shilling on this experiment. It is likely that before long a committee will be formed and the whole situation carefully reviewed. In the meantime it is interesting to note that Major Elliot announced in the House that the beet growers and the refiners had submitted a joint scheme involving both in sacrifices, which apparently, if approved, will be under the Agricultural Marketing Act and Bill.

Malting Barley.

The outlook for the barley crop sown this spring seems to be more cheerful than in recent years, for two reasons: (1) The fact that the citizens of the United States are now permitted to drink beer again, and (2) the fact that citizens of the United Kingdom are allowed to drink beer at a penny a pint less after the last Budget. Professor Grant has recently concluded an investigation on behalf of Canadian growers which brings out some interesting points about the barley trade. He states that in order to evade paying some of the tax the alcoholic content of much of the beer sold in England has been lowered, and to produce a beer of lower specific gravity a larger percentage of imported, sun-ripened, six-rowed barley must be used. As a result, while the reduced consumption of beer has decreased the total quantity of malting barley required, the relative quantity of imported malting barley has increased; but it is probable that the limit of imported barley has been reached, so that further production in Canada, Australia, or California will not be worth while. The percentage of home-grown barley fluctuates from year to year between 65 and 75 per cent. of the total. In Professor Grant's view, the most significant factors in the malting barley trade in the United Kingdom are the decreasing consumption of beer, the over-production of home-grown barley, the necessity of importing approximately one-quarter of the malting barley requirements, and the high quality demands of the maltster, which practically restrict the import demand to California. Professor Grant's report has recently been published by the Empire Marketing Board.

Science in Agriculture.

We have, on more than one occasion, expressed the opinion that in view of modern trends in agriculture and world markets the farmer should marshal to his service all the resources that modern science offers. It is interesting to note that on April 8 Sir John Russell gave an address at the annual general meeting of the Gilbert White Fellowship dealing with this problem. He said that the aim of the man of science was to obtain full control over the phenomena he was studying; failing that, power of prediction of what would happen in any set of circumstances; and if prediction was not possible, a search was made for some way round. All these three aims are exemplified in agricultural science, which, Sir John stated, was utilitarian, when it arose in the "hungry forties" of the nineteenth century and showed how the growth of plants could be increased by proper feeding. In modern times agricultural science has turned to an investigation of causes. Much evidence has accumulated to show that one can alter living things to a quite considerable extent by varying the environment. It has been shown, for example, that barley with the lowest nitrogen content gives the best beer, and Sir John referred to the efforts that are being made to get new varieties of English wheat from which a dough that will keep its shape may be made. Scientific research is obviously a slow process, and the real scientific worker never jumps to conclusions from one or two experiments, but always seeks confirmatory evidence. In the case of agriculture, the problem is complicated by the life factor and the joint influences of heredity and environment, but progress is being made, and agriculture should be grateful to such men of science as Sir John Russell and his co-workers for the efforts they are making on its behalf.

Diastatic Malt.

R. G. Harris has recently published, in the *Canadian Journal of Research*, an account of his investigations on the baking properties of flours of various protein contents with the progressive increased addition of diastatic malt. He used a series of ten commercial flours milled from Western Canadian hard spring wheat of different protein contents, and found that the addition of 2 per cent. and 4 per cent. malt increased the loaf volumes in every case, but 6 per cent. malt only gave a larger loaf than with 2 per cent. and 4 per cent. in the case of the highest protein flours used. The addition of 0·002 per cent. potassium bromate increased the loaf volume in all cases except two flours low in diastatic power. The further addition of 2 per cent. malt produced a very favourable effect on the flours of high protein content, but had no effect on these two flours. The addition of 2 per cent. and 4 per cent. sucrose did not prove as beneficial as the addition of like quantities of diastatic malt.

Rancidity.

In our last issue we published a summary of the recent views on rancidity, and it is interesting to note that it is now reported from America that edible fats and oils may be prevented from going rancid by the addition of a

small amount of maleic acid, which is a cheap and easily produced synthetic compound. Dr. Greenbank of the U.S. Department of Agriculture has applied for a public service patent for its use for this and similar purposes. Like many other important discoveries, this was arrived at rather fortuitously. Dr. Greenbank was trying to find out why some oils and fats kept naturally better than others. He did not succeed entirely in discovering this, but he did learn that the "better keepers" contained minute quantities of unidentified organic acids. This led him to add acids of known composition to oils and fats, and he soon found that maleic acid added at 1 in 10,000 of oil would enable an oil to remain without becoming rancid for about three times as long as untreated samples of the same oil. He has tried the method on a variety of fats, including butter, lard, cotton seed oil, etc., and also on milk powder and commercial pastry mixtures. He believes that it will be of use in the cereal industries. The action of the maleic acid may be the inhibition of the formation of peroxides which are intermediate states in the respirational digestive processes of the bacteria and other fermentive organisms that oxidise fats and oils, thereby splitting off the acids that give the rancid odours.

Papain.

The American discovery reminds us of an interesting patent (B.P. 382,946) in the course of which it is stated that papain (a protein-splitting enzyme occurring in the papaw tree, recalling a similar enzyme, bromelin, occurring in the pineapple) inhibits the development of rancidity in oils and fats. The juice, leaves, or sap of the papaw tree may be employed. In this patent, concentrated edible products are obtained by treating animal tissue with $\frac{1}{2}$ to $\frac{1}{50}$ per cent. of papain at 60° to 80° C. at *p*H 4·5 to 5. The process may also be used for treating cream to separate out the fat.

The finely minced animal tissue is subjected to the papain digestion until liquefaction occurs. After adding an equal bulk of water the mass is filtered hot, the filtrate obtained containing polypeptides, amino acids, etc. The solid residue is mixed with sufficient water to bring the volume up to that of the original tissue, and sodium or potassium hydroxide is added to give a *p*H of 8·5 to 9. Saponification is allowed to proceed for 30 minutes, and an oil, fat, or wax is then added and the mixture agitated for 5 to 15 minutes at above the melting-point of the added fat. The unsaponified fat is next separated by gravity or centrifuging.

The Fishing Industry.

It was announced in the House of Commons on May 8 that the Government have decided to introduce legislation providing for regulating supplies of fish coming on to the market in Great Britain, and to combine this with regulations as to the size of mesh used and size of fish landed, designed to combat the growing evil of over-fishing in the North Sea and other areas near Great Britain, as to which many complaints have repeatedly been made. It is also intended to afford facilities for the reorganisation of the fishing industry in this country. Foreign supplies are to be regulated quantitatively and arrangements are contemplated with a view to restricting landings of fish from some of the more distant fishing grounds (which are at all times relatively poor quality) at seasons of the year when supplies from these regions are surplus to the normal market requirements. In the debate, Sir M. McKenzie Wood asked whether the interests of the herring fishery industry —which is an export trade—would be guarded, and was informed in reply that the interests of herring fishers would be watched, as the Secretary of State for Scotland has the interests of this industry very close at heart.

Thus the fishing industry is to be added to the ever-growing list of industries under bureaucratic control, and doubtless will have its comptroller, its committees, its inspectors, and a hundred-and-one minor officials, together with its marketing scheme, so that in this way, at any rate, it will provide some additional employment.

Glucose.

The composition of glucose (unmixed corn syrup) is difficult to determine because of the presence of two reducing sugars, dextrose and maltose, as well as reducing dextrins and reversion products such as gallisin or isomaltose. As the result of experimental work, A. P. Bryant and R. C. Jones (*Ind. and Eng. Chem.*, January, 1933) conclude that while the fermentation method of analysing corn syrup is not entirely satisfactory it is the best one to use for determining the proportions of maltose, dextrose, and dextrins. For ordinary work and ordinary corn syrup, one-third of the total reducing sugars may be taken as dextrose and two-thirds as maltose, while the undetermined carbohydrates may be regarded as "dextrins."

Canned Frogs.

Frogs have never been a very popular food in this country, though those who have tasted them almost invariably find them delicious. Now it seems likely that this French delicacy is to be popularised in America, for an Ohio farmer has bought a hundred-acre farm to be devoted to the raising of frogs for canning. The full production, of three million frogs per year, is to be reached in 1935, but canning will start this spring. One of the products packed will be frog meat, mushrooms, and spices. It sounds very attractive!

AMERICAN JAM MANUFACTURE

◆ There are many points of interest to English jam makers in the full account given below of American practice. ◆

JAM DOES not occupy in America the prominent place in the household which it does in England; nevertheless, the manufacture of jams, jellies, preserves, and marmalades is quite a considerable industry. In 1930 the production of jams and allied products was estimated to be approximately 300,000,000 lb., and although falling off in the last two years, still amounts to a respectable total.

As we follow through the manufacture of jams or preserves from raw material to finished product, we shall find many points of interest to English jam makers.

According to the definition of the United States Department of Agriculture, " Preserve, fruit preserve, jam, fruit jam, is the clean sound product made by cooking to a suitable consistence properly prepared fresh fruit, cold pack fruit, canned fruit, or a mixture of two or all of these with sugar or with sugar and water. In its preparation not less than 45 lb. of fruit are used to each 55 lb. of sugar. A product in which the fruit is whole or in relatively large pieces is customarily designated a preserve rather than a jam."

In actual practice the differentiation between *preserves* and *jam* is not as definite as the official description, and many products having the characteristic of jam are labelled preserves, although a true preserve should have large pieces of fruit and be of lighter consistency than jam.

The Fruit.

The fruit for jam making in the U.S.A. is very largely cold packed fruit. Strawberry and raspberry, the most popular varieties, comprising nearly 60 per cent. of the total pack, are made almost wholly from cold pack fruit. Very little jam is made from fresh fruit, for the reason that most of the jam manufacturing plants are located near the centres of population and far removed from the fruit growing districts. Taking the case of strawberries, the best berries for jam making are grown in the Pacific States of Oregon and Washington, and even under very favourable conditions it is likely to be a week's journey by freight train to the consuming districts of the Eastern States, which makes the use of fresh berries out of the question. In addition, the fruit grown in the North-Western States consists of varieties pre-eminently fitted for canning and preserving purposes, as the cost of refrigeration and transportation makes it impossible for these districts to compete successfully in the fresh-fruit markets of the more populous Eastern States. Some strawberries grown in the Eastern States are used for jam making, but these tend to be dark in colour, tougher in texture, and poorer in flavour than the Marshall type strawberry of the Pacific North-West.

For jam making *strawberries* are usually packed in barrels holding 300 lb. of berries and 150 lb. of sugar, held in cold storage at 15° F. until ready for use. Space is not available at this time to discuss in detail the question of cold pack fruit, but there is no doubt that cold pack is to be preferred to canned fruit or sulphured pulp for jam making, the retention of colour and flavour being exceedingly good. If we take cold pack fruit which has been stored for six months we can make from this much better jam than the product obtained by turning the fresh

fruit into jam and storing this jam for six months. There appears to be a slight loss in pectin value with prolonged cold storage, and after about twelve months there is some breaking down of the fruit structure, particularly with strawberries, but these changes are not so serious as the changes which take place in canned or sulphured pulp or in finished jam held for the same length of time. The use of cold pack fruit renders added colour practically unnecessary if high-grade fruit is employed; colour cannot be used in the U.S.A. without a label declaration, and so rare is the use of added colour that any product which carries a declaration of artificial colour is regarded by the consuming public with suspicion. The use of added colour is, of course, always illegal in the U.S.A. if designed to conceal inferiority of raw material or finished product.

Raspberries for jam are usually cold packed with 3 lb. of fruit to 1 lb. of sugar, or 4 lb. of fruit to 1 lb. of sugar; *blackberries* with no sugar; *cherries* with 3 or 4 parts of fruit to 1 of sugar. Some fruits are not yet cold packed successfully, notably peaches and plums, which tend to become brownish in colour during storage. *Peach jam* in the U.S.A. is generally made from canned Californian peaches, and although of good colour and appearance rather lacks flavour. *Apricot jam* is usually made from imported Spanish apricots in the eastern part of the United States, as the Californian apricots are rather sweet in flavour and deficient in pectin for jam making, despite their handsome appearance. *Pineapple jam* is also quite a favourite, being made from canned pineapple imported from Hawaii. Popular *English jams* such as blackcurrant, gooseberry, greengage, and the like are only made on a very small scale in the U.S.A., although considerable quantities are imported from England. *Damson* and *plum jams* are made to a limited extent, usually from the fresh fruit, damsons in particular being available in fair quantity, although rather mild in flavour compared with Shropshire damsons.

Jellies are quite popular, and are found in greater variety than in England, possibly due to the general use of the glass container for this product, thereby taking advantage of the attractive appearance of a clear, bright-coloured fruit jelly. Grape is the most popular variety, the grapes used being of the Concord type, producing a flavour which is very little known in England. The grapes may be frozen as such, or the juice may be extracted and then kept until required at a temperature of about 30° F. Apple jelly is another favourite, probably because of its low price, as the flavour is not outstanding. Crabapple and quince jellies are also popular. Currant jelly is manufactured by several firms and resembles blackcurrant in flavour to some extent. In addition, strawberry, raspberry, and blackberry jellies are produced. At Thanksgiving-time cranberry jelly is much in demand, and is a very tasty product, usually sold in cans.

Sugar.

Apart from fruit, the only other ingredient mentioned in the official definition is sugar. Refined sugar is used exclusively, either cane or beet. Until a few years ago sugar refined in the U.S.A. to a very high degree of purity was used, but recently economic conditions and tariff

Vacuum Pan Installation.

(By courtesy of the Enamelled Metal Products Corporation, Ltd.)

complications have led to an increase in the use of sugar refined in Cuba or Porto Rico. Partly refined sugars of the Mauritius crystals type are not used in the U.S.A. Recently, in an effort to reduce the corn surplus, the use of corn sugar (known in this country as "copraco") was legalised for jam manufacture, but manufacturers have been slow to utilise corn sugar.

Pectin.

Within recent years the National Preservers' Association has made continued efforts to clarify the legal status of small amounts of added pectin or pectinous materials. According to official definitions, such materials cannot be added without label declaration, but the specifications of some of the Government departments permit the addition of small amounts of pectin or pectinous materials to make up for any natural deficiencies in the fruits. These specifications also permit the addition of small amounts of natural fruit acids—*e.g.*, citric, malic, tartaric—to make up for natural deficiencies. The National Preservers are anxious to have the official definition brought in line with these specifications, either by means of special legislation or by bringing jams and preserves under the scope of the McNary Mapes Act, which empowers the Department of Agriculture to set standards of quality for food products packed in hermetically sealed containers.

Jam Filling Machine.

(By courtesy of the Filler Machine Company, Philadelphia.)

Vacuum Boiling.

In the actual boiling of the jam, the most noticeable feature in American factories is the vacuum pan. Strawberry, the most popular jam or preserve in the U.S.A., is very well adapted to treatment under vacuum. The general principle of jam manufacture under vacuum is to concentrate the batch under reduced pressure and consequently at a considerable lower temperature than is attained with open pan boilings. The lower temperature minimises undesirable changes in colour and flavour brought about by heat, while the partial vacuum decreases the loss of colour and flavour caused by oxidation. In actual practice these advantages are somewhat offset by the prolonged heating necessary to produce the required degree of concentration at the low temperature of the vacuum pan. There is also some loss of flavour caused by the fact that the reduced pressure will lower the boiling-point of the esters and flavouring materials of the fruit, as well as of the sugar syrup, as borne out by the pleasing aroma of the condensate from a vacuum pan in operation. However, where it is desirable to produce a whole fruit jam and to maintain a bright colour, especially in the case of strawberry, cherry, peach, apricot, and the like, a vacuum pan is of inestimable advantage, and it is rather surprising that it has not found more widespread use in England.

In handling a product such as strawberry jam it is customary to concentrate the strawberry syrup to a predetermined extent in a preheater at atmospheric pressure before adding the strawberries and completing the impregnation and concentration in the vacuum pan proper. It must be remembered that in the U.S.A., where cold pack fruit is used, some of the sugar is already absorbed by the strawberries during cold storage. When a barrel of cold pack strawberries, originally put down with two parts of berries to one of sugar, is allowed to thaw, rather more than 50 per cent. of the original weight is recovered as syrup, which is preheated with the necessary quantity of extra sugar to give the 45 fruit/55 sugar ratio. In order to obtain better impregnation of the strawberries with sugar, and thereby minimise "floating" of the fruit, and at the same time keep the berries whole, it is customary to release the vacuum after a slight concentration in order to permit the berries to take up syrup gradually under atmospheric pressure before completing the process. It is also advisable to shut off external sources of heat (usually supplied from the steam coils and jackets of the glass-lined vacuum pan) towards the end of the process, and allow the batch to cool off under vacuum to a sufficient extent to prevent floating of the fruit after removal from the vacuum pan. Most vacuum pans are designed to handle about 1,000 lb. of jam or more per batch, and the evaporation is usually carried on at temperatures of 150° to 170°, and therefore the use of the vacuum pan is not very practicable for quick-setting products such as marmalade, redcurrant, gooseberry, and the like.

The end point of the concentrating process is usually determined by Beaumé reading of the syrup, by Abbé refractometer, or in open pan boilings by thermometer readings. Control of this important stage of the process has not generally been worked out so thoroughly as in England. Where the vacuum pan is not used, the jams

are generally made in large open-kettle batches. In general the pans used for this purpose are not specially designed for rapid heating, resulting in a poorer product than is customarily obtained with the smaller batches and rapid boiling pans used in England.

Filling.

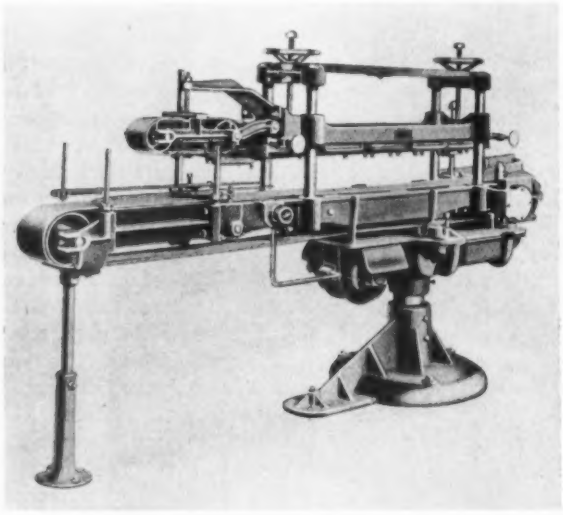
However, in the handling of the jam after it is boiled, the English manufacturer can undoubtedly study the American methods with prospects of profit. Mechanical filling of jam is standard practice in the U.S.A., and several types of filling machine are available which are simple in operation and construction and satisfactory in performance. The American manufacturer does not need to worry about the filling of stone fruit jam, but strawberry jam is a big item, and most of the commercially successful fillers will handle strawberry without undue crushing of the fruit, although hand filling is necessary if it is desired to maintain intact the perfect whole strawberry jam, which can be obtained by proper vacuum boiling of good quality cold pack fruit. The jam filling machines developed in the U.S.A. can be easily adapted to marmalade, blackcurrant, raspberry, and similar jams, and of course show appreciable saving in labour over hand pouring.

Containers.

Most of the jam made in the U.S.A. goes into glass containers. Stone pots are not used by American manufacturers, as not only are the stone pots costly and difficult to obtain, but the sales appeal and ease of handling of the glass jar are attractive features.

Closures.

Metal caps or closures are invariably used for sealing the jars. Completely hermetic seals are favoured by the better-class manufacturer, whose products are distributed over a wide area and must stand up under extremes of climate varying from the tropical to the subarctic. Space forbids a detailed description of the various types of closure available, but the general principle employed is a metal disc fitted with a rubber or composition gasket which makes a seal in contact with the top rim or side surface of the glass jar, and is held in place by a suitable band or ring with two-piece caps, or is rigidly held by the construction of the cap itself with one-piece caps. These caps are sealed by automatic machinery which can handle 100 jars or more per minute. Jams filled hot are sealed direct; but jams such as strawberry or cherry, where there is a risk of floating, are usually filled at temperatures of 150° or lower, and it may be necessary to apply the caps with a special vacuum sealing machine for these products.



Automatic Cap-Sealing Machine.

(By courtesy of the Phœnix Metal Cap Company.)

Conveying and Packing.

Once the jar is sealed the American forgets to a large extent that he is dealing with a jar of jam, and proceeds to regard the subsequent course of the jar through the factory as a problem in mechanical handling. Mechanical metal belt conveyors carrying a line of jars, or roller conveyors carrying trays of jars, are used for transferring the jam from place to place. Due to climatic conditions, it is usually necessary to convey the jam through a pasteurising tank to ensure freedom from mould (a steam treatment of the cap and neck of the jar being unsatisfactory under normal conditions). The jam should be cooled immediately after pasteurising and is then conveyed direct to the labelling machine, which is usually of the automatic type operating at 60 jars per minute or more. The labelled jars are placed directly into cases or cartons holding one or two dozen, these cases forming the final shipping container. Broken case shipments are fortunately the exception in the U.S.A., which, of course, saves considerable handling and packing costs. It is worth while noting that these fibre board shipping containers are generally used for the initial shipment of the glass jar from the glass factory to the jam manufacturer. This not only keeps breakage of glass low, but also ensures delivery of reasonably clean glass; so the jam manufacturer in the U.S.A. has a very simple jar washing problem compared with his English counterpart. In many plants all that is necessary is a rinsing or blowing out of the jars to remove lint or fibre from the cartons.

Points for Consideration

It may seem rather barbarous to English eyes to handle the jam by mechanical conveying methods while it is still in the actual process of setting; but the slight loss in jelling strength or set caused by this handling is more than offset by the savings in labour and space made possible by this procedure. This point is not so important in the U.S.A., where public preference, aided by the use of metal closures and hermetic seals, has developed a type of jam which is much "slacker" in set and consequently easier to spread and use than the very stiff jams so fre-

quently found in England. The more extensive adoption of metal closures in England should enable English manufacturers to find out if their customers really like such heavy-bodied jams or whether the physical limitations imposed by tie-over pots and jars form the true reason for the stiffness of the products. It is also interesting to note that many jams or jellies in the U.S.A. which are boiled to a relatively low sugar concentration (about 63 to 65 per cent.) and hermetically sealed and lightly pasteurised, do not suffer from spoilage due to fermentation or mould growth. This low sugar content is a definite advantage with less acid fruits, such as peach and strawberry, and helps to accentuate the more delicate flavours. These considerations, as well as the advantages to be secured from the development of mechanical handling, afford potent arguments in favour of the metal closure as adopted in the U.S.A., and together with the use of cold pack fruit and the vacuum boiling pan, should give food for thought to progressive English manufacturers.

REORGANISATION OF NORWEGIAN FISH CANNING INDUSTRY

NOTWITHSTANDING the relatively satisfactory production of brisling and musse (small herring) sardines during 1932 and the increased volume of exports, definite signs are lacking of recovery from the adverse conditions under which the Norwegian canning industry has laboured during recent years.

In considering the present situation, it has been decided that a rationalisation of the industry has become necessary, and various plans of a voluntary nature tending in this direction have been proposed during the past year, but have met with little interest and have finally been dropped.

It was found impossible to have the canners co-operate on their own initiative, and an appeal for Government help was therefore recently made. This plan differs essentially from previous endeavours in that a legislative act is to be sought by which exporters will be required to obtain an export licence covering each shipment to foreign countries.

The main instrument in carrying out the proposed plan is the A/S Hermetikfabrikkernes Brislingcentral, which will be organised as a corporation with a paid-up capital of 100,000 crowns. Exclusive rights to issue export permits will probably be given to this body. All Norwegian fish packers will be permitted to purchase shares in the central organisation, their holdings therein being in proportion to their total pack in 1932.

The purpose of the proposed plan and the organisation of the Central is to place the control of exports of brisling in the hands of a single corporation, to eliminate all competition among local packers in foreign markets, and to hold up export prices to about the foreign market value of the merchandise.

Non-members of the central body are not permitted to export, and membership is therefore virtually compulsory.

Present indications are strong that such a law will be passed in the near future.—H. W. A.

TRADE WITH FINLAND

AT the invitation of the Finnish Government a trade mission visited Finland in February of this year and noticed a genuine intention there to encourage all classes of the community to buy from Finland's best customer. In 1931 Finland's imports from Great Britain amounted to only 21·8 per cent. of her exports to that country, but in 1932 this percentage had been raised to 29·5 per cent. Of Finland's total exports Great Britain bought in 1932 no less than 46·8 per cent.

The Finns, according to the mission's report, recognise this disparity of trade and are anxious to buy more from Great Britain. They are therefore prepared to take trouble to help us and to accept for themselves a share in the propaganda and development of our trade which would normally fall on us alone as newcomers in their market.

In order to promote the sales of British goods which must make their appeal to the Finnish housewife, arrangements are now being made, at the suggestion of the Finns, to hold a British Shopping Week throughout Finland from September 4 to 11 next, during which many of the best shop windows in Helsingfors and other important centres will concentrate on the display of British goods. H.R.H. the Prince of Wales and the President of the Finnish Republic have consented to be patrons of the occasion.

The project, which is being organised in Finland by a special committee under the auspices of the Finnish-British Trade Association and His Majesty's Legation in Helsingfors, is receiving support and encouragement from the Department of Overseas Trade, and a committee in London has been appointed to deal with the business of the trade mission.

Food manufacturers are accordingly invited—not only those who are already interested and have connections in the Finnish market, but those who are seeking for sound markets abroad—to communicate with the British Week in Finland Committee, 35, Old Queen Street, London, S.W. 1. The committee is of the opinion that the project to hold a British Week in Finland is one which United Kingdom manufacturers who make articles suitable for the Finnish market should support actively, as it affords a chance to introduce their goods to the public of Finland with the minimum of trouble and expense and in an atmosphere of friendliness which may lead to business of lasting benefit.

THE MANUFACTURE OF CAKES AND BISCUITS

A Review by Dr. R. T. Colgate

C. M. STERN has translated a French work on the manufacture of biscuits, cakes, and wafers, compiled by J. Fritsch and P. Grospierre. According to the foreword of the translator, this volume is specially written for those who "seriously consider entering the industry either under the auspices of an established firm or on their own account." It must be said at once that it does not wholly fulfil its mission.

It is composed of three sections: (1) Raw materials, 92 pages; (2) Plant, 131 pages; (3) Recipes, 147 pages. The second and third sections will be found very useful for the intending or established manufacturer, but as much cannot be said of Part I. which deals with the raw materials. In this, the matter is badly chosen, poorly arranged, and often inaccurate and out of date. In fact, a perusal of this part of the volume gives the impression that the translation is at times faulty and that the writer was not too familiar with his subject.

For example, it would appear to be of little interest to those for whom the volume is intended to know that vanillin may be manufactured from coniferin, or (p. 65) that citral can be made by oxidising geraniol. The statement (p. 76) that "peppermint essence (piperonal) is the same as heliotropin" is quite inaccurate.

Throughout the pages devoted to flavours the beginner will be misled by the incorrect use of the term "essence" for "essential oil," while the order of arrangement in the same section is rather confusing.

In the pages dealing with sugars, analyses are given (p. 12) for commercial glucose which do not approximate to those usually found.

Under the heading "Fats," one may well be surprised at the statement, "Butter is obtained by the vigorous churning of cream or milk . . . by means of more or less perfect mechanical apparatus." The compositions of the biscuit margarines given on page 18 are of no practical value. No information is given as to the all-important factor of texture nor yet as to the wide differences in the types of margarine suitable for the manufacture of different types of biscuit.

It might well be asked why the two paragraphs (pp. 18 and 20) headed "Coconut Butter or Oil" and "Refined Coconut Butter" should have been separated. The information given about this important product is confused; for instance (p. 20), it is said to have a high saponification index up to about 200, while on page 21, 246 to 269 are given as the limits for the same value. On page 25 is given a cumbrous method for the detection of coconut oil in cocoa butter by means of various solvents, but there is no mention of the Polenské value.

These instances serve to characterise this section of the work, which clearly detracts from the value of the whole volume.

It must, however, be said that Part II., dealing with the plant used in the manufacture of biscuits, cakes, and wafers, goes some way to remove the impression created by Part I., and the information and excellent illustrations given will be of real use to those for whom the volume was compiled. The first portion of this section deals with machines for working up the raw materials. Modern machinery is described for dressing, blending, and weighing flour, grinding sugar to required sizes, pulping fats, grinding chemicals, pounding vanilla, washing fruits, grinding and blanching almonds, and for the preparation of such pastes as marzipan.

Chapter iii. is devoted to the preparation of different kinds of dough, and appropriate mixers are described. Reversing brake rollers and the sheeter machine are also illustrated and discussed. Next comes an account of all types of modern biscuit cutting machines, and useful information is given concerning cutters, ordinary and embossing, the use of pans and wires and the rotary machine and rout press.

Chapter v. deals with machines suitable for cake making and for the manufacture of all soft dough biscuits of the drop variety, while chapters vi. and vii. are given up to such specialities as breakfast and dinner biscuits, army and navy bread, dog biscuits, rusks, gingerbread, fruit sandwich biscuits, cream-filled sandwiches, iced and chocolate-coated biscuits.

Wafer manufacture is admirably dealt with in the next chapter and the available modern machinery illustrated and described. Following this is a good account of the baking process, in which all types of ovens are dealt with and the merits of each discussed. A useful chapter on accessory plant completes Part II.

Part III. is devoted wholly to recipes for all kinds of biscuits, and the wide range given should provide ample information for those who contemplate biscuit manufacture and also inspiration for those manufacturers who wish to vary their products.

It must be said that Parts II. and III. will prove useful and reliable for purposes of reference. If, however, accurate and up-to-date information upon the raw materials is needed, then the many available specialised works should be consulted.

(*"The Manufacture of Biscuits, Cakes, and Wafers," by J. Fritsch, chemist and engineer, in collaboration with P. Grospierre, biscüit expert and formerly manufacturing head of many large European biscuit works. Adapted from the French by C. M. Stern, A.I.L. 378 pages. 103 illustrations. Pitman. London, 1932. Price 25s. net.*)

MOULD FUNGI & FOODSTUFFS

By

L. D. GALLOWAY, M.A.

MYCOLOGY, the science of fungi (including moulds), is a difficult subject even to the specialist. Nevertheless, the food manufacturer cannot afford on this account to ignore it. The published information is scattered and, in the main, academic. Readers will therefore welcome the following survey written for their special benefit. The author states the principles that should be applied in dealing with moulds and cites the authorities to be consulted. He also summarises the characteristics of the moulds, the methods by which they may be detected and identified, their occurrence on foodstuffs, the conditions favouring their development, and the means to be adopted for their control.

Distribution and Effects of Moulds.

MOULD FUNGI are universal in distribution, and the air of any room contains mould spores ready to grow on any suitable material on which they happen to settle. Like the bacteria and the yeasts they are a common cause of food spoilage, but unlike the bacteria they are never a cause of food poisoning. There are even good moulds as well as bad moulds. Mould fungi are responsible for the characteristic flavour of many cheeses—*e.g.*, the blue "veins" in Stilton cheese are due to a *Penicillium*. Several types are employed industrially to carry out chemical processes; an enzyme preparation of *Aspergillus oryzæ* is used for a variety of purposes, including the clarification of fruit jellies. Most important of all, moulds are the principal agents in the decomposition of dead plant material which would otherwise encumber the earth and cause us considerable inconvenience.

Nature of Mould Fungi.

Moulds, yeasts, and bacteria may all be regarded as lower forms of plant life. Bacteria are only visible under the highest powers of the microscope, and multiply with extraordinary rapidity in a suitable medium—milk, for example—thus producing marked changes in a very short time.

Moulds are fungi, though their fruiting organs are more microscopic than those of the larger fungi that we term mushrooms and toadstools. Where conditions are favourable to both, moulds grow more slowly than bacteria, and cannot therefore compete with them. But in practice conditions often occur which permit mould growth while suppressing bacteria. Meat kept in a warm place "goes bad" because bacteria develop; kept in cold storage the bacteria are suppressed, but moulds can still develop slowly. Materials which are very acid (fruits), or are very concentrated solutions (syrups), support the growth of moulds but not bacteria.

Yeasts, though botanically classed as fungi, are intermediate between bacteria and moulds. Like the former class, they are unicellular organisms that only multiply under moist conditions; like the moulds, they are capable of growing on strong sugar solutions.

Here only the moulds will be considered in detail, although bacteria and yeasts may be mentioned from time to time. For a good general account of the mould fungi and yeasts likely to be met with in food mycology, the reader is referred to Henrici's *Moulds, Yeasts, and Actinomyces* (1930) and Marshall's *Microbiology* (1921).

Structure of Mould Fungi.

Mould fungi consist principally of a filamentous growth of *hyphæ*, fine threads which branch and form a tangled mass—often white and cottony—known as the *mycelium*. The filaments may or may not be divided into compartments by cross walls.

Once a mould has established itself under favourable

conditions it usually produces large quantities of *spores* (or *conidia*), which are simply "budded off" from special erect branches of the mycelium. These spores are more resistant to desiccation than the delicate mycelium, and, like the seeds of flowering plants, they act as a means of tiding over unfavourable conditions and also as a means of dispersal. Mould spores are very small; $\frac{1}{2\,5\,0}$ mm. may be taken as a representative diameter, which means that an ordinary thimble could easily contain ten thousand million or so. They float about in the air, like dust particles, for long distances, and may remain suspended for a considerable time before settling.

The shape and size of the spores and sporing parts show great variety, and are the principal means by which the mould fungi can be identified. They are therefore given prominence in the sketches which accompany this article. It is important to remember, however, that the actual "business part" of the mould is the mycelium, whose filaments cover or penetrate the foodstuff that is being attacked. One result of this structure is that it is difficult to give any accurate estimate of the amount of mould present in any sample; methods such as are used for obtaining "bacterial counts" do not distinguish between spores and fragments of mycelium—*i.e.*, the fungal filaments resulting from germination of the spores. Direct microscopic examination of the infected material is always necessary.

Spores such as have been described are the principal means of dissemination of the moulds, but it may be mentioned in passing that many fungi have, in addition, other types of spores, formed in a more complicated manner. Such spore structures are of interest principally as a means of identifying the moulds producing them.

Methods of Detection and Study.

For an adequate description of mycological methods the reader is referred to the textbooks; all that can be given here is a few hints as to the simplest effective procedure.

Owing to the minute structure of moulds, their study necessitates the use of a microscope with a magnification of at least 400 diameters, and preferably capable of use with an oil immersion objective to give a magnification of 1,000 diameters. Small portions of the fungus or mouldy material may be teased out (with needles mounted in wooden holders) in a drop of water on a glass slide, and a glass coverslip then lowered gently on to the preparation in such a way as to avoid the formation of air-bubbles. A better preparation can be made by substituting for water the following excellent mounting medium, usually referred to by the name of "lacto-phenol":

Phenol	20 gm.
Lactic acid	20 ,,
Glycerol	40 ,,
Water	20 ,,

If about 0·05 gm. of the dyestuff Cotton Blue (as supplied by makers of microscopic stains) is dissolved in the lactophenol of the above formula, mould spores and mycelium will be stained blue and their structure rendered more easily visible. Yeasts and bacteria are also stained by Cotton Blue, but are readily distinguished from moulds by their smaller size, characteristic structure, and absence of mycelial filaments. The use of lactophenol as a general mounting medium is very strongly recommended.

If it is desired to obtain pure cultures, moulds can be "plated out" by the usual dilution technique known to bacteriologists, wort agar being the best medium for general use. An excellent practical account of methods for the study of moulds is given in the book by Henrici already mentioned.

Identification.

The practical man may be inclined to think that time spent in identifying moulds might be more profitably employed in trying to eradicate them. This is not always so, however, and often a great saving of time is effected by the accurate identification of any mould which is causing trouble. One is then in a position to find out all that has been recorded in the literature about this particular organism; possibly some previous worker has found the chink in its armour—for example, some antiseptic to which it is particularly susceptible—and this knowledge can be applied to the case under consideration.

There are about four thousand genera of fungi, and some of these may each include several hundred species. A fairly large proportion of these fungi are capable of growing on some foodstuff or other, and it is obviously impossible to describe them all here. In practice, however, the moulds of most common occurrence belong to a few genera only—the most important being *Aspergillus, Penicillium, Mucor* and various genera belonging to the *Fungi Imperfecti*.

The following notes are not intended to give the impression that accurate identification is a simple matter. The reverse is the case, and the beginner is urged to be over-cautious rather than over-bold. Most of the references in the literature to *Penicillium glaucum*, for example, are misleading, since so many workers have imagined that any green *Penicillium* must be this species; actually there are some six hundred separate and distinct green *Penicillia*.

Pure cultures of moulds can be obtained at a nominal charge from the National Collection of Type Cultures, Lister Institute, Chelsea. Identification work of plant-disease fungi is carried out by the Imperial Mycological Institute at Kew, who would probably also be prepared to help workers in the food industries.

Aspergillus.

This includes many of the common green moulds, and also some which are black, white and various shades of brown. The spores are borne in chains radiating from a characteristic "knob" at the end of a special upright branch of the mycelium (Fig. 1).

Exact identification of a species is often difficult, but

the genus *Aspergillus* has been divided into a number of natural sub-groups, and it is comparatively simple to recognise these almost at sight after a little experience. The *Aspergillus glaucus* sub-group is of special interest since its moisture requirements are very modest; these species, consequently, are the first to appear on material which is just damp enough to go mouldy.

A full account of the distribution and characters of this genus is given by Dr. Charles Thom in his book *The Aspergilli* (1926).

Penicillium.

The genus *Penicillium* includes most of the common green moulds occurring at ordinary temperatures. The spore-bearing organs are not unlike those of the genus just described, but if the spore-head of *Aspergillus* is compared to a mop, that of *Penicillium* resembles a birch broom or a paint brush. *Penicillium* is readily recognised under the microscope (Fig. 2), but further identification of the six or seven hundred species is extremely difficult even to the specialist. Thom, in a companion volume to *The Aspergilli*, deals very fully with the genus (*The Penicillia*, 1930), but is unable to simplify the task of identification to any great extent. In his preface Thom describes the harmful activities of the *Penicillia* as follows:

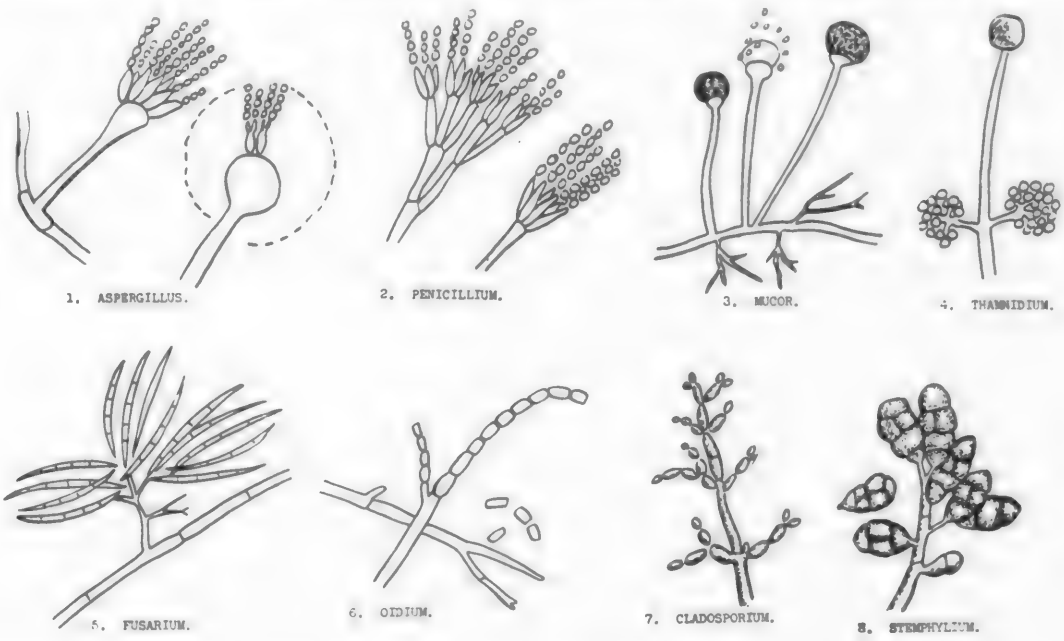
"They rot our fruit, attack our vegetables and meat, injure our stored grain, spoil our soft drinks and our bottled water, contaminate our pantries and kitchens, and even attack our bodies."

The Mucors.

This term is used here to cover the large and difficult group of which *Mucor* is one genus, and of which a typical example is *Rhizopus nigricans* (*Mucor stolonifer*). *Rhizopus nigricans* often occurs as a greyish felt on damp bread or other material, dotted with black spots like pin-heads which are the sporangia (spore-bearing organs) shown in Fig 3. Fig. 4 represents *Thamnidium*, a common mould on meat in cold storage. For the identification of the *Mucors* consult Lendner, *Les Mucorinées de la Suisse*, or the extract given in Henrici's book.

Fungi Imperfecti.

The group known as *Fungi Imperfecti* is one which is artificial and unpleasing to the botanist, since it includes many fungi which are probably quite unrelated but afford no criterion for further classification, since only the "budding off" type of spore formation is known. Strictly speaking, most species of *Penicillium* and many species of *Aspergillus* should be grouped here since they have only the one type of spore.



The *Fungi Imperfecti* include types with light-coloured mycelium and spores, and types with darkly pigmented mycelium and spores. Of the former group, *Fusarium* (Fig. 5) and *Oidium* (Fig. 6) are perhaps of most interest to us; in the latter group are *Cladosporium* (Fig. 7) which, with *Stemphylium* (Fig. 8) and *Alternaria*, produce troublesome dark stains and variety of substrata.

For the identification of this group the most satisfactory reference book is Lindau's *Die Mikroskopischen Pilze*.

Occurrence of Moulds on Foodstuffs

The following brief survey does not claim to give a complete inventory of the moulds attacking foodstuffs, but summarises some of the modern investigations scattered throughout the literature of the subject. Since this

summary was compiled, Tanner's *Microbiology of Foods* (1932) has appeared, and can be strongly recommended as a book of reference to the food technologist interested in moulds, yeasts, and bacteria.

I. Cereal Products.

Stored grain tends to develop moulds, with their accompanying musty odour and other undesirable effects, whenever its moisture content rises above a safe limit. This figure is 12 per cent. for maize, rising to about 16 per cent. for wheat and oats. Moulds act on the germ and starchy material of the grain to give organic acids, and in consequence of this the acidity of cereal products is often taken as a measure of their deterioration. The germinating capacity of seed grain or barley for malting is often seriously impaired by mould growth. At higher moisture contents (say 30 per cent. or over) bacteria begin to develop, with consequent souring, spontaneous heating, and other harmful effects.

Bread is free from moulds when it leaves the oven, but if kept in a damp atmosphere it readily develops moulds. Since bread normally contains over 40 per cent. of moisture it is an excellent substratum for fungal growth. In addition to green species of *Penicillium* and *Aspergillus*, several species of *Monilia* cause diseases of bread. A red discoloration is sometimes due to *Monilia sitophila*, and "chalk disease"—causing white lumps in the pores of sliced bread—has been attributed to *Monilia variabilis* and *Endomyces fibuliger*. *Mucors* are also of common occurrence.

Mould diseases of bread are less frequent now than they were in the days of home baking, when one bake had to last a week or more. The introduction of wrapped bread has also effected an improvement. Wright (*J. Soc. Chem. Ind.*, 1916) states that the use of flour infected with *Rhizopus nigricans* leads to a musty flavour in the bread made from it.

Many cereal products (biscuits, macaroni) have had most of the water abstracted from them, and are therefore immune from mould growth unless they are exposed to very damp conditions.

II. Dairy Produce.

The most important organisms affecting dairy produce are bacteria—notably the lactic acid bacteria. Yeasts are a not uncommon source of trouble in cream and butter.

Milk.—The only mould fungus which is at all frequent is *Oidium lactis*, which may form a white felt at the surface of the milk, submerged parts of the mycelium breaking up into segments as shown in Fig. 6. *Condensed milk*, if unsweetened, is sterilised at the time of canning; sweetened condensed milk usually keeps well by virtue of the high concentration of sugar, but it occasionally develops "buttons" due to *Aspergillus repens* (Dahlberg and Evans, 1920). This may be prevented by low temperature storage or sealing the cans under a vacuum.

Butter frequently develops discoloured areas due to mould fungi. Blackish patches are due to *Cladosporium* or *Alternaria*; green patches are due to *Aspergillus* or *Penicillium*; orange patches are due to *Oidium* (Thom and Shaw, 1915). Much may be done to avoid such trouble by scrupulous cleanliness, scalding of vessels and of wrapping parchment, and by the use of cream which is as fresh as possible, or else pasteurised (Macy and Coombs, 1927). Salted butter is much less subject to moulds than fresh. Macy (1929) finds that *Mucor*, *Rhizopus*, and *Oidium* are inhibited by 5 per cent. salt in butter, but that some other moulds will withstand several times this concentration. Parchment paper used for wrapping should be in good contact with the butter, any air spaces tending to encourage mould development.

Cheese.—As already mentioned, some cheeses owe their characteristic flavour to certain types of mould fungi. Roquefort (France), Gorgonzola (Italy), and Stilton (England) all owe their mottled appearance to *Penicillium roqueforti*. The ripening of such soft cheeses as Camembert is carried out by encouraging a surface mould growth on the cheeses. Some moulds, however, are undesirable. *Penicillium brevicaule* (*Scopulariopsis*) frequently overgrows Camembert, and its presence in the cheese room is marked by a strong ammoniacal odour. *Oidium lactis* is a common cause of undesirable flavour; it neutralises the acidity of the cheese and thus permits the development of putrefactive bacteria. Stored cheeses sometimes suffer from mould spoilage at the surface layers, and Cheddar cheeses are sometimes dipped in melted paraffin when several days old in order to prevent this.

III. Meat, Eggs and Fish.

Meat cannot be kept for prolonged periods except in cold storage. This checks bacterial decomposition, but permits slow growth of moulds which may cause surface stains. These stains, though unsightly, do not make the meat unfit for eating. "Black Spot" is due to *Cladosporium herbarum; Sporotrichum carnis* causes white spots, *Mucor* and *Thamnidium* cause greyish "whiskers," and green patches are usually due to *Penicillium*. Control measures comprise cleanliness (including removal of infected meat), maintenance of constant humidity, and keeping the temperature below 18° F. (Brooks and Hansford, 1923; *Food Investigation Board Special Report* 17). Since many of the moulds can grow at freezing-point, chilled meat is more liable than frozen meat, and should be kept in a drier atmosphere.

Mustiness in hams is considered by Thom to be due in many cases to *Penicillium brevicaule*.

Eggs.—Eggs are by no means immune from mould spoilage. If the eggs are stored in a damp place mould spores settling on them will germinate, and the resulting hyphæ will penetrate the shells. Old eggs are stated to be more susceptible than freshly laid eggs. Almost any mould is capable of infecting eggs in this way, but species of *Penicillium* and *Cladosporium* are most commonly reported in practice (Postolka, 1917).

Fish.—Fish in cold storage, like meat, may develop mould growth, and this is by no means always suppressed by the brine present.

IV. Sugar and Sugar Products.

Aspergillus, Penicillium, and other moulds, as well as yeasts and bacteria, develop in the crude juices obtained in the preparation of cane and beet sugar. They are a source of loss by causing the inversion of part of the saccharose. Sugar in damp storage also suffers damage due to moulds—*Aspergillus* (especially *Aspergillus Sydowi*), *Penicillium, Cladosporium,* and *Mucor* being the most common types, according to Kopeloff (1922).

Syrups containing up to 65 per cent. of sugar are still subject to slow mould and yeast growth (Hirst, 1927). Jams and lemon curd will mildew at the surface unless protected by waxed discs, or metal tops may be used and the surface layers sterilised by heat.

V. Fruit and Vegetables.

Fungi causing spoilage of stored fruits and vegetables include those moulds which only grow on dead material, and also types which are parasitic on living plant tissues. The former class includes all common genera—*Penicillium, Aspergillus, Mucor,* and *Fusarium* being the most frequent. *Rhizopus nigricans* causes spoilage of strawberries in transit. On stored apples *Penicillium expansum* is the typical mould, but *Aspergillus* and other *Penicillium* species also occur. Citrus fruits develop spots due to *Penicillium italicum* (blue green) and *Penicillium digitatum* (olive green).

Mould fungi usually establish themselves on damaged portions of the fruit, and consequently careful handling and packing are of utmost importance. Boric acid and borax treatment has been recommended for citrus fruit. A more recent treatment, which does not seem very promising at first sight, consists in dipping the fruit into viscose solution, and thus forming a thin protective layer of cellophane.

Fruit juices readily develop a surface growth of moulds. "Bottle imps" are usually due to a restricted growth of *Penicillium,* forming a plug of matted mycelium. *Penicillium italicum* occurs on lime juice in cold storage. Fruit syrups and jellies are usually only protected from moulds by their surface being covered from the air. Coating with a film of pectin has recently been advocated (Ripa, 1931).

Onions are subject to attack by *Aspergillus niger.*

VI. Miscellaneous.

Nuts, if not stored dry, develop mould spoilage. The infection, usually *Aspergillus* or *Penicillium,* takes place through cracks in the shells, and careful handling is therefore of importance.

Cocoa.—Cocoa beans must be sufficiently dried; if they retain over 9 per cent. moisture, moulds will develop—*Mucor, Aspergillus, Cladosporium,* and *Monilia.* Cocoa butter made from affected beans will have a musty flavour.

Copra is also apt to develop moulds, some of which are definitely harmful. The rancidity of coconut oil has been shown to be due in some cases to species of *Penicillium.*

Pickles, sauerkraut, and similar materials undergo, during preparation, a lactic fermentation which prevents the growth of putrefying bacteria. Such materials are not immune from moulds, notably *Oidium lactis,* and should be protected from mould spoilage by the exclusion of air.

The Conditions Necessary for Mould Growth

It will have become evident from the foregoing summary of some of the commoner instances of food spoilage, that the main factor favouring mould growth is a high moisture content. This is because the fungi obtain their food by absorption through the cell walls of the mycelium, and consequently all their nourishment must be in solution. The minimum moisture content for mould growth varies for different materials; for example, the 15 to 16 per cent. we have quoted for wheat is intermediate between the minimum moisture regains for "mildew" growth on two textiles, cotton (9 per cent.) and wool (23 per cent.). In the case of many foodstuffs it is impossible to keep the moisture content sufficiently low, and other means have to be adopted.

The other prime necessities for mould growth are (1) a sufficient food supply, and (2) an ample air supply. By the former is meant an adequate supply of all the essentials for growth—just as man requires a "balanced diet." Moulds cannot build themselves up from inorganic substances as can the higher plants, but must obtain their energy by the breakdown of some carbohydrate or nitrogenous substance. In addition, they must be supplied with traces of elements such as phosphorus if growth is to continue. An ample air supply is essential to all moulds, and for this reason they usually occur as surface growths only.

Little has been said about temperature, since moulds can occur throughout a range from below freezing-point to above blood heat. As a general rule, however, 25° C. (77° F.) represents the optimum temperature for the majority, and cold storage slows down their growth very considerably.

Methods for the Prevention of Mould Spoilage

Mould growth may be guarded against in a variety of ways, which may be considered under the following headings:

1. Asepsis, or freedom from infection.
2. Sterilisation, or killing of infection.
3. Absence of oxygen.
4. Cold storage.
5. Absence of water.
6. Concentration of dissolved material.
7. Use of chemical preservatives.

I. Absence of Infection.

It is obvious that without moulds, food cannot go mouldy. In practice this ideal is difficult, for even if the

material is sterile when made, it is subject to constant infection by spores from the air. Anything that can be done to reduce this contamination by the installation of air filters or by any other means is a step in the right direction. Cleanliness in handling, the removal of infected materials, and a clean atmosphere are all of the utmost importance. Ketchup made from mouldy tomatoes, for example, cannot be expected to be a high quality product.

Certified milk, wrapped bread, and eggs in water glass all represent more or less successful approaches to asepsis.

II. Sterilisation of Heat.

Mould spores are much more easily killed by heat than are the spores of many bacteria; the most resistant fungal spores are destroyed after a few minutes at 80° C. (176° F.). The process of "pasteurising" as applied to cream, fruit juices, etc., is therefore usually sufficient to kill off any existing mould growth. More drastic sterilising, such as that employed in canning, undoubtedly destroys all moulds.

III. Absence of Oxygen.

Since moulds require oxygen for their growth, the vacuum established during canning would do much to check their growth even if the spores had not been destroyed by heat. Moulds in canned goods only occur as a result of leaky containers.

It has been shown that an atmosphere composed of 50 per cent. carbon dioxide and 50 per cent. air is sufficient to suppress mould growth, and even 25 per cent. carbon dioxide produces a marked reduction of growth. This fact is worthy of consideration in connection with modern systems of fruit storage, and the use of "dry ice" (solid carbon dioxide) as a commercial refrigerant. Kileffer (*J. Ind. Eng. Chem.*, 1930) has shown that meat and fish keep longer in an atmosphere of carbon dioxide, and Thornton (*Ibid.*) gives a list of the optimum concentration of this gas for the storage of a number of fruits and other foodstuffs. Recent work carried out for the Food Investigation Board (Moran, Smith, and Tomkins, 1932) suggests that with the aid of carbon dioxide storage, chilled meat might be successfully imported from Australia without mould damage.

An American patent (U.S.P. 1,647,749) describes the prevention of mould growth on cheese, meat, and vegetables by covering them with a thin film of a tasteless mineral oil which protects them from the air. Jams, pickles, and similar products develop moulds if they are exposed to the air.

IV. Preservation by Cold.

Cold storage is perhaps the most important of the methods used for preventing the decomposition of food. It alters the appearance, flavour, and chemical constitution of the food comparatively little. For the prevention of moulds the temperature should be as low as possible, and the relative humidity of the storage atmosphere should also be low. For certain kinds of food, however, too dry an atmosphere or too low a temperature is harmful, so that the best storage conditions must be specified for each kind of food separately. Sudden changes in temperature or relative humidity are always inadvisable since they may cause the condensation of moisture on the stored material.

V. Absence of Moisture, or Desiccation.

By far the most important factor influencing mould growth is moisture. Many food products contain very little moisture, and can be kept sufficiently dry to prevent the development of moulds, and incidentally of bacteria, which demand a higher moisture content. Grain and nuts are examples of this type, but the critical moisture content below which moulds will not develop can only be found out by experiment. Once known, the safe moisture content can be maintained by controlling the relative humidity of the storage chamber. This in turn may be lowered by raising the temperature of the storage chamber. We thus often have the curious position that although a rise of temperature from, say, 15° C. to 20° C. would cause a slight acceleration of mould growth on a damp substratum, yet a similar rise produced by fitting a storage room with hot pipes is often the very best way to prevent mould spoilage. The total moisture remains the same, but the air is capable of holding more and the food material is therefore drier. A more accurate control of humidity can be obtained by installing a special air conditioning plant.

Humidity control should also be directed towards the avoidance of sudden fluctuations in the relative humidity; these are apt to cause moisture films which encourage the germination of mould spores.

Many foods, which in their natural state have a high moisture content, may be preserved in a dried state. Meat, fish, fruit, vegetables, milk, and eggs can all be preserved in a dried form. Such drying not only prevents the growth of micro-organisms, but also inhibits the action of the enzymes in the food material. Some of the methods adopted for desiccation of foods have other preservative action; for example, smoke curing adds volatile antiseptic substances, salting increases the concentration of dissolved matter (see next section).

VI. Concentration of Dissolved Substances.

If animal or vegetable tissues are immersed in strong salt solution water passes out from the tissue cells (plasmolysis); this causes the protoplasmic contents to shrink and the cell ceases to function. Bacteria and moulds, which, like higher organisms, have a cellular structure, are unable to grow in strong salt solution, and the use of brine in food preservation depends on this. Ten to fifteen per cent. of salt, calculated on the water present, is usually sufficient to suppress mould fungi. In minced pork 2 per cent. of salt has been found to suppress bacteria, and 7 per cent. moulds, while yeasts continue to grow at still higher concentrations.

A similar effect is produced by strong sugar solutions.

Bacteria are suppressed by 15 to 40 per cent., but unfortunately yeasts and moulds resist much higher concentrations—up to 65 or 70 per cent.—and it is rarely possible to utilise sugar concentration to prevent moulds.

VII. The Use of Chemical Preservatives.

Spices have long been used as preservatives, but as regards mould prevention they are not very efficient. Bachmann (1918) finds cinnamon and cloves to be the most antiseptic of the spices tested.

Chemical preservatives which can be used in sufficient concentration to suppress micro-organisms, and at the same time will not produce poisonous or deleterious effects in the food, are extremely rare. As a consequence, this method of prevention of spoilage should only be considered as a last resource. As regards mould fungi the case is especially difficult, since these organisms are far more resistant to antiseptics than are bacteria. Moulds will grow in the most unlikely places, as anyone who has worked in a chemical laboratory must have noticed. Boric acid is perhaps the most useful of the weak antiseptics, and has been recommended for preventing moulds on citrus fruits. Formalin is excellent for disinfecting purposes, but not to be recommended for human consumption. Benzoic and salicylic acids have considerable toxic effect on moulds, and esters of *para*-hydroxybenzoic acid have recently been advocated.

PAPER CONTAINERS

TEN years ago, owing to the growth of the industry, it was found necessary to publish a textbook on the manufacture of all kinds of paper containers. This book* was compiled by Mr. P. E. Verstone, editor of the *Paper Container*.

As the first volume of its kind, it almost immediately became a standard work of reference. Since that time the use of the paper box, bag, packet, bottle, and every other form of receptacle has become so universal and indispensable that the methods of manufacture have improved both in accuracy and speed. The book has therefore been revised and brought up to date, and now includes a great number of illustrations as well as being extremely informative. In short, it is well worth the attention of readers interested in the study of efficient packing.—F. V. W.

* *The Manufacture of Paper Containers.* Revised Edition. 204 pages. 200 illustrations. Verstone and Co., 29, Ludgate Hill, E.C. 4. 15s. 6d. net.

A NEW PREPARED FOOD

CANNED baked apples are now being manufactured in the United States, adding another ready-to-serve food to the rapidly growing list being offered to customers. This product is stated to improve in the can with age.

FOODS AND DRUGS: THEIR ADULTERATION AND ANALYSIS

A BOOK which embodies the experience of half a century can lay claims to being more than an ornament for the library shelves. Mr. J. F. Liverseege, formerly Public Analyst to the City of Birmingham and author of *Adulteration and Analysis of Foods and Drugs*, can rest assured that his book will be hard worked as a source of reference in every laboratory in which it may find itself. Since his retirement, Mr. Liverseege has occupied himself in giving an account of the analytical methods and research which had been found useful in the Birmingham Municipal Laboratory. These records cover 100,000 commercial samples of foods and drugs. Of equal importance are the abstracts of about 1,400 prosecutions, which will be found invaluable to solicitors engaged in adulteration cases and also to analysts. These have been selected to show the variation in adulteration of a particular food or drug, and in many cases the arguments which led to the conviction or acquittal of a defendant are given. Methods of keeping records and forms are also included in this work, and an account of sampling, with its methods and pitfalls. A chapter on methods of calculation will undoubtedly be found useful.

The scope of this work is such that it is invaluable, not only to public analysts, but also to chemists engaged in the manufacture and testing of foodstuffs generally. The multiplicity of methods of analysis makes it difficult to select those which will yield quick and accurate results. For various types of foods and drugs, Mr. Liverseege has rendered chemists a valuable service by indicating the analytical methods which he has found to be most suitable during his long and extensive experience.

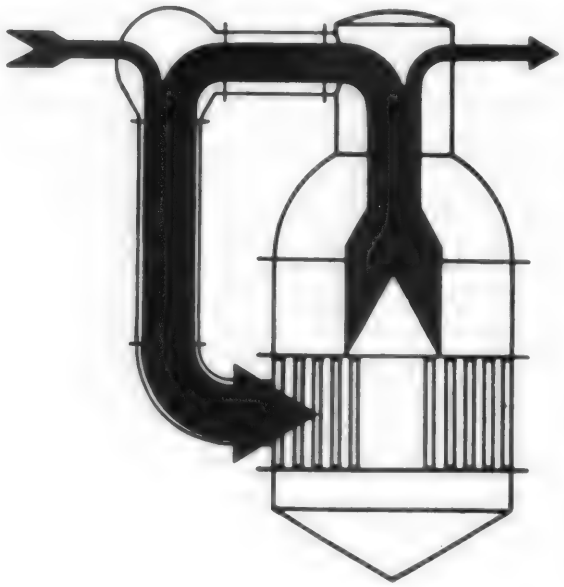
An important feature of the book is the inclusion of the compositions of genuine and adulterated samples of food products actually on the market.

The methods of procedure and a comprehensive list of prosecutions for adulteration assist the public analyst with information most necessary in his work of maintaining high standards of purity and quality.

The book is a work of reference which can be confidently recommended to all engaged in the preparation, handling and testing of foods and drugs, and everyone will agree with the Rt. Hon. Neville Chamberlain's tribute to Mr. Liverseege: "Long acquaintance with his work in Birmingham enables me to say that, while few public analysts have had a more extended experience, none can have brought to their task a more conscientious thoroughness and reliability or a greater sense of fairness to all concerned."—H. B. C.

("*Adulteration and Analysis of Foods and Drugs*," by *J. F. Liverseege. 600 pages. Numerous tables.* 1932. *J. and A. Churchill, London. Price* 36s.)

EVAPORATION in the FOOD INDUSTRIES



So much interest has recently been incited by the remarkable claims made for the Lurgi system of evaporation developed in Germany, and now introduced into this country, that we have invited Mr. Hugh Griffiths, B.Sc., A.R.C.Sc., who is an authority on the subject, to expound the principles upon which this high vacuum vapour recompression system of evaporation is based. The adjacent figure illustrates the system diagrammatically.

IN THE evaporation of food products such as milk, malt extract, fruit juices, tomato purée, and similar materials, not only is it essential, in view of the fact that the percentage of water present is usually fairly high, to ensure economy in heating steam, but in almost every case the evaporation must be accomplished at the lowest possible temperature. In the case of many of these substances the demand for high quality has also made it necessary to consider carefully, not merely the influence of the evaporating temperature of the liquor, but also that due to the temperature of the heating surfaces with which the liquor is brought into contact during evaporation. The physical principles underlying these operations have not always been clearly explained, and it is only within the last few years that special types of evaporating plant have been developed which will enable thermal economy to be secured and at the same time not only the evaporating temperature but also the temperature of the heating surfaces to be maintained within the desired limits.

Thermal Economy.

It will be understood that in any steam-heated evaporator a very large proportion of the heat supplied to the apparatus is given out again in the vapour produced, and it is only natural that efforts should have been made to make use of the heat contained in the vapour in such a way that it would do further evaporative work. The most usual procedure has, in the past, been to employ multiple-effect plants, in which the vapour is employed to heat an evaporator in which the liquid is boiled at a lower temperature. The number of effects which may be employed in series in this way is dependent upon the nature of the solution treated, and also upon the total available temperature difference. It will readily be seen, however, that whereas in the last effect the temperature may be, for example, 45° C. under favourable conditions, the temperature at which evaporation is taking place in the previous effects must be higher.

Although this method has been extensively applied to materials which are not particularly sensitive to heat, it will readily be understood that, notwithstanding the economies in heating steam which are possible, this type of plant has not come into favour for the evaporation of food products which are sensitive to heat, and it is not surprising to find that in actual practice for the evaporation of such substances the single-effect type of plant is still of considerable importance.

There is, however, an alternative method of utilising the heat in the vapours which consists in recompressing them, thus raising their saturation temperature and enabling them to be used in place of a large proportion of the original heating steam. It will be recognised that in this system use is made of the principle of the reversed heat engine, and that by application of mechanical energy the heat contained in the vapour is made available at a higher temperature. Thermodynamic considerations will show that if the temperature difference be small, a very large quantity of heat may be made available at the higher temperature with a very moderate expenditure of mechanical energy. This system of evaporation was at first applied to solutions of inorganic salts and to materials which were not particularly sensitive to heat, the apparatus working approximately at atmospheric pressure, but developments have now taken place whereby the working temperatures have been reduced by employing high vacua, and it has been found not merely possible to reduce the evaporating temperature, but also to maintain the temperature of the heating surfaces far below those obtaining in ordinary types of vacuum evaporating plant.

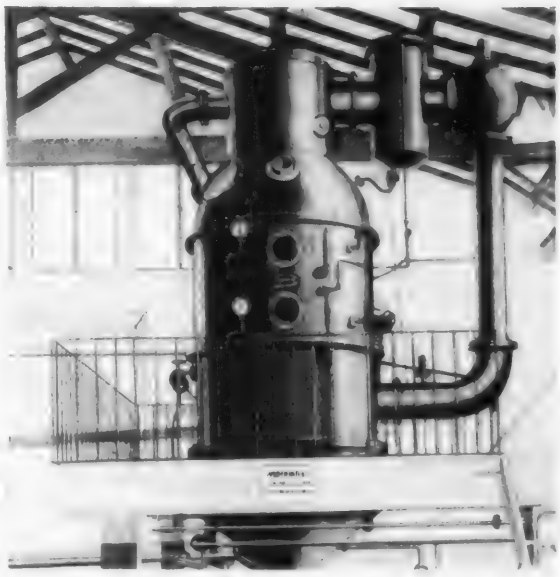


FIG. 2.—Tomato Concentration Plant.

Evaporation Temperature.

From the above it will be realised that while a multiple-effect plant may be capable of giving satisfactory economy in operation from the point of view of steam consumption, this economy can only be obtained if it be permissible to perform the greater part of the evaporation at a relatively high temperature. Even though a single-effect plant be employed and thermal economy be sacrificed, there is a serious disadvantage in that the temperature of the heating surface is too high for many purposes.

Notwithstanding the rapid circulation which takes place in vacuum evaporators, the film of liquid in contact with the heating surface is invariably overheated, and in spite of a good vacuum being employed the products are liable to suffer. For example, condensed milk is liable to discolour and form granules consisting of separated lactose or protein and to acquire a characteristic taste. Fruit juices acquire a taste, and colour changes are difficult to avoid. Materials containing enzymes or vitamins also suffer considerable damage, even though they are evaporated under vacuum.

Attempts which have been made to overcome these difficulties by heating by means of hot-water circulation systems have proved to be costly and unsatisfactory.

By employing the high vacuum recompression system it has been found possible not only to secure economies in heating steam which compare very favourably with those of multiple-effect plants, but at the same time to keep both the boiling temperature and the temperature of the heating surfaces down within the desired limits. In consequence of these advantages it is not surprising to find that, although this system of evaporation has only been perfected in recent years, many installations have already been erected.

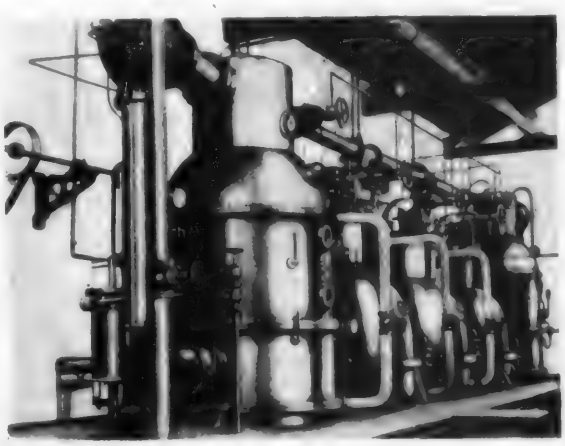


FIG. 1.—Complete Installation for the Concentration of Tomato Purée.

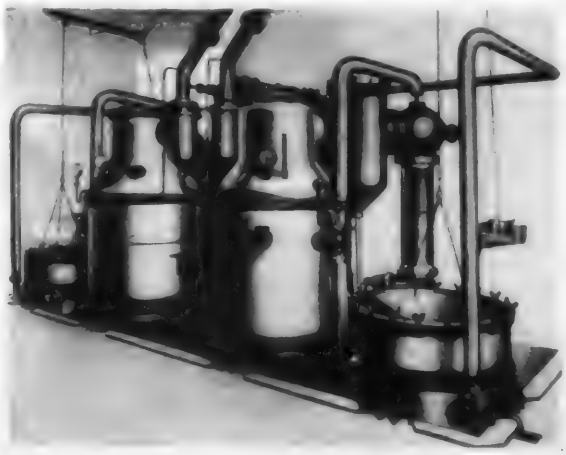


FIG. 3.—Milk Condensing Plant.

Vapour Recompression.

While the general principle of vapour recompression has been understood and applied for many years, the design of practical evaporating plants suitable for use in the food industries is of comparatively recent date. The compression of the vapours has in the past been attempted by means of reciprocating compressors, turbo-compressors, and steam jet compressors.

The problem is not so simple as would appear at first sight, and it will be understood that in evaporating the material under high vacuum the volume of vapour to be compressed, even in a plant of moderate size, is such that the choice is practically restricted to turbo-compressors and steam jet compressors. The turbo-compressor may find application in countries where power of hydro-electric origin is very cheap, but in the majority of works where food products are manufactured the heating steam has to be drawn from a boiler plant directly, and, in consequence, the steam jet compressor, which has no moving parts, has been most extensively used. It may be mentioned that the actual design of a steam jet compressor or thermo-compressor involves some very highly technical considerations, and it is impossible to secure reasonable efficiency unless this important apparatus is specifically designed with accuracy to meet the working conditions, and costly investigations have been necessary to bring these devices to their present state of efficiency.

Not only has care to be exercised in the design of the steam compressing arrangements, but the evaporator

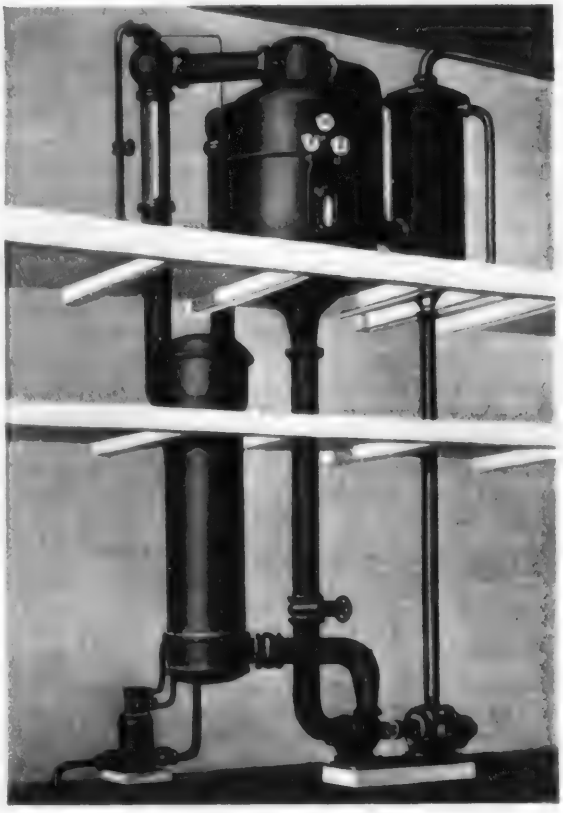


FIG. 5.—Forced Circulation Evaporator with Vapour Compressor for Viscous and Scale-Forming Solutions.

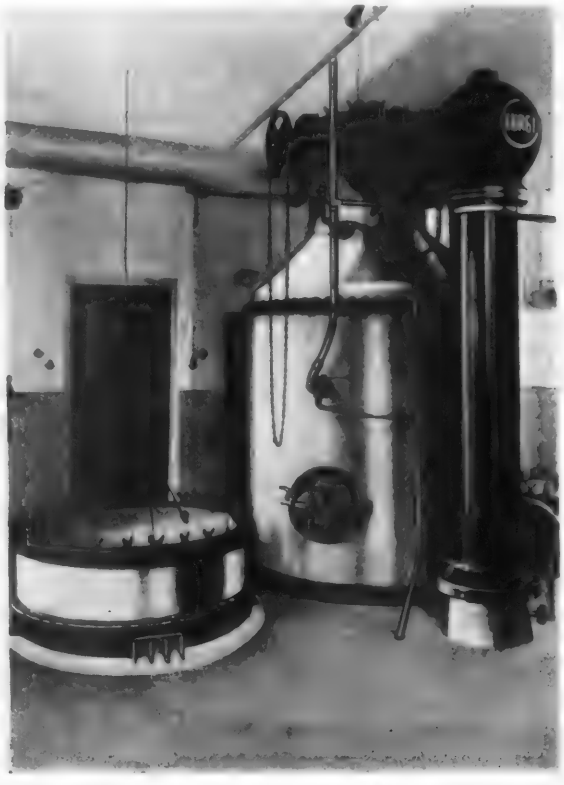


FIG. 4.—Milk Condensing Plant.

itself must be proportioned correctly to suit the physical conditions. In view of the fact that, in evaporating a substance which is very sensitive to heat, a low temperature difference must be employed, special provisions have to be made in order to secure high coefficients of heat transfer; specially important in this direction are the maintenance of rapid circulation and the removal of non-condensible gases from the heating system.

In the case of materials which become viscous during concentration the circulation may be mechanically assisted —*i.e.*, the evaporator employed is of the forced circulation type.

The Lurgi high vacuum vapour recompression evaporators are designed according to certain patented modifications of the vapour recompression system, whereby not only can the evaporation be accomplished at temperatures lower than that obtainable even with the best-known type of single-effect plant, but with a very much lower steam consumption, and at the same time the temperature of the heating surfaces may be kept within a few degrees of the boiling temperature. A careful study of the conditions which control heat transfer has been necessary in order to secure these results, and these plants have given satisfaction not merely by reason of the fact that they maintain the desired physical conditions, but in consequence of the quality of the concentrated products obtained.

Figs. 1 and 2 illustrate plants specially designed for the

concentration of tomato purée. Figs. 3 and 4 show plants specially designed for the evaporation of milk. Fig. 5 shows the modified form of apparatus used for substances which become viscous during concentration. This apparatus is provided with an external circulating pump, and special arrangements are provided which will enable scale-forming solutions to be evaporated without difficulty.

As an indication of what can be done in practice with installations of this kind, it may be mentioned that while the thermal efficiency of the plant naturally has an influence upon the capital cost, just as in the case of multiple-effect plants, installations are actually at work in which the steam consumption is only 0·25 lb. per lb. of water evaporated, and plants are also at work in which the boiling temperature is as low as 30° C.

About 200 plants have already been built and are in commercial use, and form an interesting proof of the importance of the study of thermodynamics as applied to industrial practice.

CHEMICAL PROGRESS

THERE are 721 pages of authoritative and closely packed information contained in the seventeenth volume (covering the year 1932) of the *Reports of the Progress of Applied Chemistry*, published by the Society of Chemical Industry, 46-47, Finsbury Square, London, E.C. 2.

The reports included are by men who are well known, for the most part, in the chemical world, and are specialists in their own particular fields. The contents are listed as follows:

"General, Plant, and Machinery." "Fuel." "Gas, Carbonisation, Tar and Tar Products." "Mineral Oils." "Intermediates and Colouring Matters." "Textiles, Fibres, and Cellulose." "Pulp and Paper." "Bleaching, Dyeing, Printing, and Finishing." "Acids, Alkalis, and Salts." "Glass." "Refractories, Ceramics, and Cements." "Iron and Steel." "Non-Ferrous Metals." "Electro-Chemical and Electro-Metallurgical Industries." "Oils, Fats, and Waxes." "Paints, Pigments, Varnishes, and Resins." "India-Rubber." "Leather and Glue." "Soils and Fertilisers." "Sugars, Starches, and Gums." "Fermentation Industries." "Foods." "Fine Chemicals, Medicinal Substances, and Essential Oils." "Photographic Materials and Processes." "Explosives." "Sanitation and Water Purification."

The section on Foods has been contributed by G. D. Elsdon, B.Sc., F.I.C., Lancashire County Analyst, and, as one would anticipate, the treatment is largely from the analytical chemist's point of view. Although this survey has been carried out in a remarkably able manner, considering the somewhat restricted space of 19 pages allotted for the purpose, we feel that much more consideration should have been given to scientific and technical progress in the food industry. In a volume entitled *Reports of the Progress of* Applied *Chemistry* one would expect to find that stress has been laid on the recording of technical research work which has a direct bearing on manufacturing processes and on scientific investigations which assist in elucidating the principles upon which factory operations are based. In this respect we have no fault to find with Mr. Elsdon's excellent summary of the work carried out at the Cambridge Low Temperature Station on the freezing of meat; but we find scanty reference to the equally important questions of the freezing and other methods of preserving fish, fruit, and vegetables. There is also nothing on more or less fundamental work that has been carried out on the curing of bacon and hams, the pickling of vegetables, the canning of food products in general, the baking of bread, cakes, and biscuits, the manufacture of sugar and chocolate products, various special cereal and milk foods—to mention only a few subjects with which investigators in America, Germany, and this country have been concerning themselves during the past year. This is probably because the author's attention has been largely confined to a rather restricted range of literature, no doubt due to the lack of space which has been placed at his disposal.

May we suggest, with all due respect, to those responsible for the publication of these Reports that the author of the Food section has sufficient space in which proper justice can be done in so far as the recording of investigations as applied to the food industry is concerned?—H. B. C.

FOOD LITERATURE

MISS A. G. GLENNIE, B.Sc., of the Low Temperature Research Station's Library, at Cambridge, continues with her good work of sifting, classifying, recording, and commenting upon the formidable output of the world's literature on foodstuffs, their science, and manufacture. We consider that the idea of compiling this Index is a particularly happy inspiration on the part of the Food Investigation Board, that the work has been well performed by Miss Glennie, and that the industry and its scientific satellites ought to be grateful for the service. We are afraid, however, that they do not fully appreciate their good fortune and that this Index might with advantage be known more widely. The task of compilation is a particularly arduous one, and a glance through any one of the volumes convinces one that Miss Glennie has carried out her task with more than ordinary thoroughness, ability, and, what is equally important, an intelligent understanding of the subjects concerned. Some day, perhaps, Miss Glennie might find time to essay a *magnum opus* in the form of a "Super-Index" which will tabulate under authors' names and subject matter all the references which have appeared in the various volumes of the Index so far published.—H. B. C.

(*"Index to the Literature of Food Investigation." Vol. IV. No. 2. September*, 1932. *Compiled by Agnes Elizabeth Glennie, B.Sc. Department Scientific and Industrial Research. H.M. Stationery Office, London.* 1933. *Price 2s. 6d. net.*)

ULTRA-VIOLET LIGHT . . . . . ITS USE IN THE CONTROL OF FOOD PRODUCTS

A SUMMARY OF RECENT INVESTIGATIONS
BY JULIUS GRANT, Ph.D., M.Sc., F.I.C.

IT IS not proposed to deal in this article with the methods of production of ultra-violet light.* Reliable mercury-vapour lamps are now offered by a number of firms, and in spite of their rather high rate of deterioration, they are relatively cheap. Since they can be operated from the ordinary lighting supply (A.C. or D.C.) they are convenient to instal and simple to use.

The term ultra-violet light is used to designate electromagnetic (*i.e.*, light) waves slightly less in length than the shortest rays of the visible spectrum—namely, the violet of the rainbow. The actual lengths of the waves in this region range from about 136 to 4,000 Å., where 1 Å$=10^{-8}$ cm. They are therefore too short to be visible to the human eye, although, since the light emitted by a mercury-vapour lamp has a vivid glare, it is often thought that ultra-violet rays must be visible. Similarly, the sun emits a certain amount of ultra-violet light of relatively long wave-length, in addition to its visible rays, but, of course, far less in intensity.

In work with ultra-violet light, therefore, the best results are obtained if the visible rays are absorbed by means of Wood's glass or any other suitable filter, since in this way the fluorescence of the object under examination is not masked by external illumination. Experiments in dark rooms under these conditions have shown that substances hitherto considered quite inert are fluorescent.

The mechanism of fluorescence is still a debatable question. It appears to be associated with the atomic structure of the substance concerned, and has been attributed to the emission of energy on the passage of an electron from one orbit to another. A practical point to be remembered, however, is that it is very susceptible to slight impurities in the substance concerned, and this fact explains apparent contradictions in the results of workers on this subject. In such work, therefore, it is important to follow a strictly standardised technique in order to obtain comparable results, and to work with samples of known origin and history.

Dairy Products, Fats, etc.

Butter and Margarine.—Since butter has a relatively faint yellow, and margarine a strong blue, fluorescence, the presence of 15 per cent. or more of the latter in butter is detectable, especially if the sample is examined in solution in petroleum spirit and compared with a sample of genuine butter. Here again, however, the importance of standardised conditions is evident, since addition of certain pigments may depress the blue fluorescence of margarine, whilst certain vegetable fats and the unsaponifiable matter from cod liver oil may increase it. This last observation was the origin of attempts to correlate vitamin content with the intensity of the fluorescence, although on the whole these have not proved entirely convincing.

The colour of the fluorescence of butter is modified slightly by changes which occur on ageing (*e.g.*, rancidity and oxidation), and so the portion to be tested should be taken from the centre of the sample.

Cocoa Butter.—The fluorescence of butter is also modified by the presence of other vegetable fats, the most important effects being produced by cocoa butter the fluorescence of which also depends on its origin. Thus non-fluorescent samples are obtained from lightly roasted beans, and a strong fluorescence indicates a solvent extraction process, or else contamination with a mineral oil.

Baker's work on butters (*Analyst*, 1932, Vol. 57, pp. 38, 129) appears most conclusive, and he states that as little as 5 per cent. of coconut fat will affect the colour of butter fat, while the presence of 15 per cent. or more can be detected with certainty even if no pure butter is available for comparison purposes. Baker gives it as his opinion that the method is of more practical value than any other test (with the possible exception of the volatile fatty acids determination) used in routine work. Out of nearly 870 genuine and 86 adulterated samples only about 12 gave doubtful results.

Freshly rendered fats from the goat, cow, and sheep only differ slightly in fluorescence from butter fat, but on ageing for a month they also develop a blue colour. Artificial colouring matters added to butter may also interfere with the test by masking the fluorescence, and they should be extracted in boiling water or removed by treatment of the fat with animal charcoal.

Lard.—The early work was full of contradictions, fluorescence colours of different shades being recorded

* Such information is easily available elsewhere (see Radley and Grant, *Fluorescence Analysis in Ultra-Violet Light*).

by different workers, and even the absence of fluorescence. These variations have since been traced to the origins and treatment of the product. Thus good commercial lards have a white or yellow shimmer in ultra-violet light, although after exposure to light and air, or treatment with steam at 150° C., a distinct blue tinge appears. This blue colour is particularly characteristic of Dutch lards.

It is probable that the fluorescence of lard is produced during refining, possibly by the destruction of some compound which normally inhibits fluorescence This is supported by the fact that heat destroys this inhibitor, although freezing or treatment with animal charcoal leave it unaffected.

Milk.—Milk normally has a yellow fluorescence, which changes on exposure to sunlight to white and then to blue. It has been variously ascribed to urobilin, vegetable pigments, albumenoids, and metallic constituents, but Würster's experiments on rennet (*Zeit. Fleisch. Milchhyg.*, 1930, Vol. 11, p. 379) resulted in the isolation of lactochrome, a substance with a vivid yellow-green fluorescence which also turns blue on exposure. Nevertheless, the colour is influenced by metallic impurities, and especially by iron.

Cream.—Since genuine cream from fresh milk has a yellow fluorescence, while that from aged milk has none, a means is provided for estimating the age of milk samples. Genuine cream may also be distinguished from artificial cream, since the latter appears white with a marked bluish tinge.

Cheese.—As cheese ripens the colour of its fluorescence changes progressively from white, through yellow, to blue. Living cheese fungi may often be distinguished from dead by the bright green fluorescence of the former, and the method is therefore particularly applicable to cheeses such as Gorgonzola or Roquefort.

Eggs.—Egg white has a characteristic bluish shimmer, and the yellow fluorescence of the yolk of a hen's egg is easily distinguishable from the redder colour characteristic of that of a duck. Waegeningh and Heestermann (*Chem. Weekblad*, 1927, Vol. 24, p. 622) have based a method for the determination of the age of eggs on the fact that the fluorescence changes continuously, a set of solutions containing 0·1 to 12·5 per cent. of gelatin being used as standards. Thus an egg 16 days old has the same fluorescence as the 0·25 per cent. solution, while the 12·5 per cent. solution corresponds with 120 days.

Cases have been reported in the Press from time to time in which removal of the mark of origin from the shell of an egg has been detected by means of ultra-violet light, which shows up the spot where the erasure has been made as a white patch against the dull purple of the shell. The present writer has also used the method with some success for the detection of eggs preserved in water-glass. Although the appearance of the shell of such eggs remains unaffected, promising results have been obtained when the shell is painted with indicators which fluoresce at alkaline *p*H values (*cf.* J. Grant, *The Measurement of Hydrogen Ion Concentration*, Longmans, Green and Co., 1930). With a little practice frozen eggs may be picked out by a distinct reddish shade in the purple fluorescence of the shells.

Preservatives.

Sulphites.—The writer has described a method suitable for the detection of 0·25 mg. of SO_2 (*Analyst*, 1932, Vol. 57, p. 514). It depends on the liberation of sulphur dioxide by acid and distillation into bromine water which oxidises it to sulphuric acid. This gives a vivid blue fluorescence if shaken with a speck of quinine.

Boric acid heated with fluorescein gives a compound whose fluorescence is detectable in dilutions as great as 1 in 10,000, but this test, although very useful, necessitates a preliminary separation of the acid in the usual way. *Benzoic acid* and its salts fluoresce blue, whilst the violet fluorescence of *sodium salicylate* is so intense that 1 part in 25,000 of milk is detectable.

Spices, which also come conveniently under this heading, fluoresce characteristically, so that the various peppers and mustards and their adulterants may be differentiated. The method is, however, not very convenient, and a fluorescence microscope is really required in order to pick out the finer details of structure.

Miscellaneous.

Space does not permit more than mention of the numerous other possibilities of the ultra-violet lamp in the food industry. *Flours*, for example, may be differentiated, wheat and rye flours appearing blue, barley grey, potato brown, pea red, and soya flour yellow. As little as 2 per cent. of vetch or 0·5 per cent. of zinc oxide in flour may be detected from the orange-red and reddish-yellow colours respectively.

Of the *fermented liquors*, natural and artificial vinegars may be differentiated, and by examination of extracts of wines in amyl alcohol Litterscheid (*Zeit. Unters. Lebensm.*, 1927, Vol. 54, p. 294) has been able to detect 25 per cent. of fruit wine from the azure-blue colour it imparts to grape-wine. The acidity of many wines is difficult to determine by ordinary titration on account of the wine itself, but by the use of indicators which change in fluorescent colour at the end-point (see J. Grant, *The Measurement of Hydrogen Ion Concentration*, 1930) this difficulty is easily overcome.

Finally, it should be mentioned that *sugars* differ in fluorescence according to their origin and purity (especially their ash contents), and pulps used in *jams*, etc., may be distinguished in a similar way. A sensitive test for malic acid, and therefore for apples, is performed by evaporating the sample with resorcinol (or orcinol), the residue being dissolved in sulphuric acid, which is then neutralised with sodium hydroxide solution, when in the presence of malic acid a bright blue fluorescence appears. *Honey* may also be investigated in ultra-violet light, but as the method in most cases depends on an examination of the absorption spectra, it is not well-suited to routine work.

ENGLISH JAM

The debate on "Standards for Jam" continues. Last month Mr. Craig Bain attacked certain points of an article which appeared in the July issue. Below are found other points of view, including that of the author of the July article.

BROADLY SPEAKING, this discussion on jam standards revolves round two opposed points of view—that of the "purists" and that of the "worldly hard-heads." It is, of course, impossible to reconcile them completely. Out of last month's discussion the following main points emerge:

1. There is room on the market for jams of all qualities, but the grade of quality should be made evident to the consumer by data as to ingredients and their proportions being stated on the label.

2. First-quality jam should be made from fruit and sugar only, without any addition whatever. The minimum standard should be 1 lb. of fresh fruit to 1 lb. of pure sugar, as used in home-made jam.

3. The Jam Standards are not sufficiently explicit in respect of the nature, proportions, and qualities of the ingredients permitted.

4. The 30 per cent. of blackcurrants in first-quality jam is too low.

5. The U.S. and Canadian standards require a higher proportion of fruit than do the English standards. Is this because English fruits are richer in pectin than are the corresponding American fruits, or is it because the American public prefer a jam of firmer consistency?

6. Doubt is thrown on the English food laws as to their ability to ensure protection of the consumer. They are regarded as out of date and inadequate under present conditions.

7. It is a mistake (and, in practice, impossible) to adopt hard-and-fast standards for every food, especially mixed foods.

We will now turn to arguments put forward in defence of the Jam Standards, following these by a reply from the author of the July article "Standards for Jam—The American Viewpoint," and conclude with various critical expressions of opinion.

The Jam Standards a Success.

An authority of considerable experience writes:

If I may express a private opinion to you on the subject of jam standards, I would say that they have proved in practice to be a workable proposition. Whatever may be their shortcomings, according to folk whose interests lie in one aspect of the problem rather than in the problem as a whole, since they have been accepted and worked by 95 per cent. of both the jam trade and the public analysts of the country, I claim that they have been a success.

In setting out to devise standards, the intention was to produce a workable compromise consistent with the public demand, manufacturers' practices, and public analysts' ideals, and the minimum fruit content, which gives a reasonably good-quality jam and does not preclude any manufacturer from producing an article which would satisfy even your South African friend.

The Jam Standards Defended.

Another authority gives the following account of the considerations which were taken into account in framing the jam standards:

With reference to Mr. Craig Bain's article on the standards for jam, I should like to make some remarks on several points raised by him, but will confine myself strictly to the question as to whether the standards are or are not unjustifiably low. There are many other points of almost equal interest in Mr. Bain's article, but I prefer not to obscure the main issue.

As jam is an article which has been manufactured in this country (on approximately its present lines) for over sixty years, its character and composition have developed along certain lines as the result of the response of the buying public to the various types and qualities placed on the market from time to time.

When the manufacturers met as a body to discuss the setting up of standards, they naturally took the view that these standards should be based on those types and grades which appeared to satisfy the largest proportion of the buying public, both as regards price and quality. While it is true that there were quite a number of grades of jam on the market at that time, these mainly fell into two divisions, the better grade being that sold by the well-known makers and a considerable number of others less well known. This grade was and is chiefly bought by middle-class people. The lower grade was, of course, mainly sold in the poorer districts, where the price of the better grade puts it beyond the purchasing power of the people. Needless to say, all grades were made of wholesome material.

As the result of their accumulated experiences, the manufacturers decided that there should be two grades of jam and that the higher grade should correspond with that which had apparently met the public requirements for a high-class jam (having regard to both price and quality). While it is true that there are one or two manufacturers who make jam with considerably higher per-

centages of fruit than those of the standards, these jams have only a limited sale, as the prices are of necessity much above those the average middle-class person can afford.

The standards are, therefore, based on the results of the manufacturers' experience of what can and what cannot be sold to the majority of the public. It should be noted that these standards are minima, and there is nothing to prevent a manufacturer using more fruit if he wishes to, and in a number of cases this is done. The fact that, relatively, only small quantities of the specially fruity jams are sold would seem to justify the manufacturers in their conclusions as to the character of jam required by the majority of the people. It is obviously no use making a 50/50 jam if the public refuse to buy it either because it is too expensive for them or because it is uneconomical in use on account of its stodginess. It is for a combination of these reasons that the standard for blackcurrant was fixed at a minimum of 30 per cent. Some of the leading manufacturers have, in the past, attempted to make this jam with quantities approaching the 50/50 basis, only to discover that the public would not buy it for the above reasons, and they had perforce to reduce the percentage of fruit once more. Even with the present standards, a considerable number of complaints have been made regarding the stodginess of some lines, particularly stone fruit jams.

The whole point about the standards is that for the first time in the history of this country the public are given a guarantee by the manufacturer that the product they buy conforms to a definite composition, as regards the fruit and sugar content. In other words, the purchaser is able to get what he or she asks for, and that at a price which is virtually standardised as the result of competition. If the price and quality of full-fruit standard jams do not suit a purchaser, he or she is not compelled to buy them; there are other non-standard jams on the market still, but it must be obvious from the fact that none of the leading manufacturers have broken away from the standards agreement, that the majority of the public are satisfied with their purchases of these standard jams. They are getting value for money and are not "buying a pig in a poke," as inferred by some of the critics. The latter and others have already in various ways advertised the nature of the standards, so surely there can be no deception of the purchaser of a standard jam, and, after all, is not this the essential principle underlying the setting up of standards for any product, no matter whether the standard is for a high or a low grade article?

The critics of these standards are always harking back to the quality of jam as "made by mother." Well, we should all like to believe that mother's jam is best, but is it always so? Some of those who have bought home-made jam at bazaars could, no doubt, answer this question. This, however, is beside the mark, for even if all home-made jams were the best in the world, it would not solve the manufacturers' difficulties. As already pointed out, even if there were no technical difficulties in the manufacture and sale of such jam—and there are many—the price and consistency of the product would prevent him developing a business of any size. Let those critics who do not believe this back their opinions financially by attempting to manufacture and sell jams to the public. If their claims are right—viz., that the public wants the type of jam they advocate—then they should have the opportunity of making a fortune, for here is a field in which there is only the minimum amount of competition. However, let them be warned beforehand that, despite Mr. Monk's gibe at the application of science to this industry, there are many difficulties to be met with besides that of price.

To sum up: The standards are, on the whole, as high as practical and economic considerations will permit, and they give the public a fair deal so far as they go. It is not claimed that they are standards of quality—*i.e.*, as regards the quality of fruit—as they do not distinguish between fresh fruit and pulp jams. This further step can only be taken when means of maintaining standards of quality can be devised. Such a standard can only be efficiently maintained by a rigorous system of inspection of both factories and factory stock, books, etc., as purely chemical methods cannot be relied upon to distinguish between the two types of jam in all cases.

They Have Justified Themselves.

From Mr. A. R. Tankard, F.I.C., the City Analyst for Kingston-upon-Hull, comes the following statement:

I am glad to respond to your invitation to comment on the question of English jam standards raised by Mr. L. Craig Bain. To understand the present position it is necessary to know something of the official history of jam in this country. In spite of adverse comments of public analysts all over England for many years past—comments usually accompanied by the intimation that owing to the absence of legal standards of any kind for this commodity little administrative action could be taken—the powers that be did nothing to bring our jams up to a reasonable standard of fruit content, nor to limit the admixture of any extraneous substances with the fruit and sugar mainly employed in their making. It is not to be wondered at, therefore, that the Society of Public Analysts welcomed the opportunity of conferring with the Jam Manufacturers' Federation with a view to setting up standards for jam and similar products.

The results of their deliberations are well known, and for the first time it was possible for a public analyst to initiate action against a jam which contained an inadequate percentage of the named fruit and for the public to have some guarantee as to the quality of the product purchased. It has never been claimed that the agreement arrived at is wholly above criticism, but it can be contended that, broadly considered, the result of these unofficial standards must be that the general quality of jam and similar products will be decidedly higher than of late years. To argue that the standards adopted are not high enough is surely beside the point—for without the standards there was no guarantee of any particular percentage of fruit in jam. The agreement was of course necessarily a compromise, and a first step on the road to improvement in the quality of the foods specified.

In the writer's experience, jams which in the past have had to be certified as complying with the minimum requirements (because of the lack of standards of any kind) will not under these agreed standards be passed as satisfactory, and can be dealt with by applying such unofficial standards, whilst the consumer can select first or second quality jams. I do not believe that the existence of these standards will lower the general quality of jams any more than I believe that the Sale of Milk Regulations have lowered the general average quality of milk in the country.

With regard to the specific points raised in this discussion, I contend that 42 per cent. of strawberry fruit in jam of that name is a reasonable proportion, and am well aware that much home-made jam does not contain so much fruit. The proportion of 30 per cent. of blackcurrants in jam seems low, but no doubt there are adequate reasons for this; and it should be borne in mind that the average percentage of fruit in "first-quality jams," apart from this instance, is practically 40 per cent. (range, 35 to 45 per cent.), or only 9 per cent. below the highest average standard ever suggested in this country (see below).

The agreed (unofficial) standards for jam of the Food Manufacturers' Federation and the Society of Public Analysts were the first standards for these products in this country, and they have, in my opinion, amply justified themselves. Not only do I believe that they have raised the average quality of the product of some factories, but they have caused such a "liveliness on the home front" that English fruit growers and others have persuaded the Ministry of Agriculture and Fisheries to fix "National Mark" standards for "conserves" of quality; conserves made from fresh fruit (40 to 55 per cent., average 49 per cent.) and containing nothing but fruit and sugar.

There is no reason why both standards should not exist side by side, for much jam will still continue to be made in factories from fruit pulp either of British or foreign origin. I welcome "National Mark Conserves," and regard them as the natural outcome of the much-maligned, but still useful, unofficial standards of the Food Manufacturers' Federation and the Society of Public Analysts.

The Author Replies.

It was most interesting to read "Antipodean's" comments on an article of mine dealing with standards for jam. I feel, however, in justice to myself, that most of the criticisms voiced by "Antipodean" should be directed towards the joint committee which devised the jam standards in England. I think that careful reading of my original article will show that the general theme of my remarks was a discussion of the principles involved in setting standards for a product such as jam rather than a detailed criticism of the actual standards. I am in agreement with "Antipodean" in considering the food law system in England as rather out of date. This fact, however, renders the co-operation between the Society of Public Analysts and the Jam Manufacturers' Federation all the more noteworthy, as by taking the law into their own hands and establishing definite standards they have set a very good example. It is possible that the actual minimum fruit content set by the standards is too low: I know that some jam manufacturers with a reputation to maintain customarily use more fruit than the standard requires. Nevertheless, it would seem reasonable to assume that the Society of Public Analysts and the jam manufacturers in England would be more familiar with what the English consumer expects in the way of jam than the present writer in the United States or "Antipodean" from presumably the other side of the world!

I have no apology to offer regarding my position on fruit juices in jam. If we first assume that the fruit content is satisfactory, then there can be no objection to the use of fruit juice to give the desired consistency. Those with experience of jam making know that the use of sufficient fruit to give this consistency will result in a product of inferior flavour and appearance. The use of fruit juice to give consistency is, of course, no excuse for the substitution of cheaper fruit juices for the typical fruit of the jam. This brings us back to the subject of actual fruit content desired which, in the long run, will be decided by the responsible authorities in England. When we come to the comparison of the standards in England and North American countries discussed in my original article, I feel that my position would have been stronger if I had stated that the difference in standards can be *partly* explained by differences in characteristics of the fruit in different countries, as naturally other questions are involved, as pointed out by "Antipodean." Nevertheless. I know from actual experience that there is a big difference in flavour and jam making properties between fruits grown in England and those grown in North America. Even though the pectin in strawberries measured as calcium pectate may be identical in England and in Canada, it does not follow that the strawberries will give a jam of the same consistency or flavour. Chemists with actual experience of jam making will agree with me that no chemical method of evaluating pectin will give results in accordance with the setting power of the fruit in actual practice, as questions of quality or condition of pectin, acidity or *p*H value, neutral salts and the like are involved. Similarly, any number of calcium pectate determinations would fail to convince me that North American blackcurrants (or redcurrants, or damsons, or raspberries) will give a jam of a flavour or consistency comparable to the same weight of European fruit. This is a case in point where actual manufacturing experience has an advantage over conclusions drawn from chemical analyses.

In conclusion, I would suggest to "Antipodean" that he re-reads my original article in the light of the above explanations, and trust that he will find that it contains more substance than his apparently hasty first reading indicated. It was certainly not my intention to boost the actual standards arrived at in England, but rather to commend the principles upon which they were developed. Mr. Monk points out in discussing food laws in the January, 1933, issue of FOOD MANUFACTURE, the need for a new system of food regulations in England, and it seems to me that the setting of jam standards is a step in the right direction, even if experience shows that the standards themselves require modification.

Unfair to Consumer.

A public analyst writes as follows:

I have always considered that the standards adopted in 1930 were unfair to the consumer, when compared with the usual "1 lb. of fruit to 1 lb. of sugar" of our home-made jams, and I personally object to the permission given in the regulations for the use of artificial dyes and added acid. Pectin may or may not be necessary; anyhow, there would not be the same necessity for its use if larger quantities of fruit were used.

The practice to which I object most strongly is that of substituting sulphited pulp for fresh fruit, and anyone who has seen the horrible-looking fruit pulp, bleached white, which comes into this country from Russia and elsewhere for the use of jam manufacturers, must deplore the change which has come over the industry. And this goes on while our home fruit growers are being reduced to bankruptcy.

Show the average housewife some imported sulphited pulp and I guarantee she will make an effort to prepare her own jam at home in future.

I know it is said that the home fruit season is so short that something has to be done to keep workers and machinery employed, but manufacturers used to manage without this mummified material; why cannot they do so now?

Higher Fruit Content.

Mr. C. H. Manley, M.A., F.I.C. (Public Analyst for the City of Leeds), contributes the following comments:

I was extremely interested to read Mr. Craig Bain's criticisms following so soon on my own remarks in brief contained in my comments on Mr. Monk's article on "New Food Laws" (April number, page 136). Mr. Craig Bain more than confirms my view that higher percentage contents of fruit in some jams might well be aimed at, the general public being in the dark as to the real significance of so-called "full-fruit standard" jams.

Not having been a member of the Society of Public Analysts' Committee which discussed this question of jam standards with the manufacturers, I am unaware of all the arguments urged for and against the adoption of the present agreement, and would refrain from being unduly critical at this juncture.

The recognition of the present figures by the two parties concerned probably represents something preferable to the state of chaos which previously existed. That improvements will be effected when the Ministry of Health Committee of 1931 resumes its work is something we may reasonably expect. A requirement of a statement of the minimum percentage of fruit on the label of every jar of jam for sale should help to cause this figure to approach that for home-made jam in the case of the better quality article.

Ambiguity of Jam Standards.

Mr. H. H. Bagnall, B.Sc., F.I.C., Analyst to the City of Birmingham, gives the following views:

The term "full-fruit standard" applied to jam manufactured by the Food Manufacturers' Federation is naturally interpreted by the housewife as meaning the highest quality. That it is nothing of the sort is proved by the publication, by the Ministry of Agriculture, of a proposed National Mark specification for jam. By way of comparison, the amounts of fruit per 100 lb. of the finished jam required respectively by this specification and by the full-fruit standard are cited.

The figures for strawberry jam are 55 lb. and 42 lb.; for raspberry, blackberry, damson, and loganberry, 50 lb. and 38 lb.; and for blackcurrant, 40 lb. and 30 lb. For other varieties the amount of fruit is 10 lb. greater in the Ministry of Agriculture standards than in the Food Manufacturers' Federation standards. Further, whereas in full-fruit standard jam the use of other fruit juice, pectin, glucose, acids, colouring matter, and sulphited pulp is allowed without any declaration to that effect on the label, the National Mark jam must be made from sound, fresh fruit and cane sugar only. No addition of colouring matter or flavouring material, pectin or other setting materials or acid is allowed.

These comparisons serve to show the wide difference between the views of the Ministry of Agriculture and of the Food Manufacturers' Federation as to what constitutes a high-quality jam, and it also serves to indicate that English ideas are, after all, very little different from American and Canadian ones.

The fact is that in full-fruit standard jam the only thing that is standardised is the *quantity* of fruit, and this is, in every case, fixed at a very low figure as compared with what the housewife would regard as necessary when making her own jams.

No one would object to the sale of such jam if it were labelled properly. Why is the Federation so shy of advertising to the public what the term really means? The definitions appear only in scientific journals and trade papers, and these are not read by the members of the general public and thus they have no means of knowing what they are buying.

Food standards should be clear and unambiguous, and should define different grades of the same product in such a way as to make plain the difference between them. To do this all factors affecting the quality should be taken into account, and, above all, an inferior grade should not be described in terms applicable only to the highest quality. This is the great defect in the present English jam standards.

(This discussion will next month be brought to a close by a special contribution from Mr. Thomas McLachlan.)

USEFUL PUBLICATIONS

Two useful publications recently issued are (1) *Organic Reagents for Metals*, prepared by the staff of the research laboratory of Hopkin and Williams, Ltd. (price 1s.), and (2) *The Engineering Aspects of the Condensing and Drying of Milk*, by Dr. A. W. Scott, issued as Bulletin No. 4 by the Hannah Dairy Research Institute.

FRUIT PRESERVATION

T. N. MORRIS is a familiar name to readers of FOOD MANUFACTURE, and indeed to all who are concerned with the canning and freezing methods of preserving fruit. The owner of the name is one who, in addition to high scientific attainments and a distinguished career in applied research, has had practical experience with one of the foremost firms of fruit preservers in the country. Mr. Morris is a member of the research staff of the Low Temperature Research Station at Cambridge where, in collaboration with Mr. J. M. Bryan, he has conducted important investigations into the corrosion of tin-plate containers by food products (*Food Investigation Board Special Report*, No. 40, 1931), and he has also published accounts of his researches on the freezing of fruits and vegetables. In addition, he is the author of various articles on jam making, pectin, and kindred subjects, some of which we have published in this journal.

The appearance this month of a book on the principles of fruit preservation, including jam making, canning, and drying, written by Mr. Morris, is therefore an event of the first importance. This book is based on nine years of research and factory experience in the fruit-preserving industry and five years' research on the special problems of fruit canning. Much is therefore expected, nor is one disappointed. As an exposition of the scientific principles and control of the various processes involved in the preserving industry, the book attains a high standard. It is sound and both well written and well arranged. This is what anyone would anticipate who knows Mr. Morris and the great care and ability which he brings to bear on his work.

Having said something about the author, without attempting to flatter unduly, we turn to the contents of the book. It starts off with a discussion of the composition of fruits, and proceeds to a refreshingly clear exposition of pectin and the principles of jelly formation in terms of the trinity, pectin—sugar—acid, about which so much that is confusing has been written. Having laid a scientific foundation, Morris then goes on to discuss the principles of jam manufacture.

Part II. is devoted to the canning of fruit—sorting, grading, blanching, syruping, exhausting, sealing, and processing. Following this is a chapter on spoilage, in which the various aspects of corrosion are examined in detail, and then a chapter on the examination of canned fruits for factory control and diagnosis of the causes of spoilage.

Part III. deals with dried fruits, and outlines the principles of dehydration and the methods employed in the drying of fruits. Finally, in Part IV., various considerations relating to the discoloration of fruit products and the vitamin content of canned and dried fruits are discussed.—H. B. C.

(*"Principles of Fruit Preservation," by T. N. Morris, M.A. 240 pages. Illustrated. Chapman and Hall, Ltd., London*, 1933. *Price* 15s. *net.*)

IMPERIAL FRUIT SHOW

THE 1933 Imperial Fruit Show and Canners' Exhibition will be held in the Coliseum, Park Row, Bristol, from Friday, October 27, to Saturday, November 4, 1933.

The exhibition embraces all classes of fresh and processed fruits, and everything used in the production and marketing of these commodities. Not the least noteworthy items in the show are the conferences arranged for growers, canners, and retailers, which are said to have been very successful in recent years.

Previous shows have been held in London, Manchester, Birmingham, and Leicester, the three former cities having been visited on more than one occasion, but this will be the first visit to Bristol. The Coliseum is situated in Park Row, near the University, and is conveniently reached from all parts of the city.

A total of approximately 40,000 square feet of floor space will be available for growers' entries and trade exhibits. Large sections of floor space are being set aside for a combined display by Empire countries, and for a Canning Section, in which a number of leading canners and manufacturers of canning machinery and appliances will take part.

The show programme will include conferences for growers, a Canning Convention, and, it is hoped, visits to the Research Stations under the control of the University of Bristol. Immediate steps are being taken to organise a Bristol Advisory Committee, on which local representatives of all sections of the industries covered by the exhibition will be invited to serve.

A GUIDE TO THE CHEMICAL INDUSTRY

THE ninth edition of the *Chemical Engineering and Chemical Catalogue* has recently made its appearance, having been thoroughly revised and brought up to date. The ease of reference which was a characteristic of earlier issues has been maintained, and projecting index tags enable any desired section of this comprehensive annual to be found immediately.

The amount of information the compilers have managed to compress between the covers of the book is certainly surprising. The first "catalogue" section of chemical products and plant, arranged in alphabetical order under the names of the manufacturing firms, has by now well proven its value to buyers and works managers; the data and tables section is still kept up to date; while the revised bibliography, Spanish index, classified index of products and plant, etc., enable the one book to do the work of three or four. Altogether, it is an assistant no busy executive would care to be without.—(*"The Chemical Engineering and Chemical Catalogue," edited by D. M. Newitt, Ph.D., B.Sc., D.I.C., A.R.C.S., etc.* 1933. *London: Leonard Hill, Ltd. Price* 10s.)

New Companies

YOUNGER CATERERS, LIMITED. (274390.) 53, Lambs Conduit Street, W.C. 1. To carry on the bus. of food mnfrs., farm produce and poultry suppliers, etc. Nom. Cap.: £100 in 1s. shares.

HOME FLAKE PURE FOOD COMPANY, LIMITED. (274574.) 47, Bennett Road, Bournemouth. To take over the bus. of grocers and provision mchts. cd. on at Bournemouth and Southampton. Nom. Cap.: £6,000 in £1 shares.

SINGLETONS (BOLTON), LIMITED. (274541.) 45, Bury New Road, Bolton. To take over the bus. of a baker and confectioner cd. on at Bolton. Nom. Cap.: £250 in £1 shares.

BRITISH TEA PRODUCTS, LIMITED. (274663.) To carry on the bus. of tea mchts. and blenders, etc. Nom. Cap.: £1,000 in £1 shares.

CALDER VALE EGG PACKERS, LIMITED. (274949.) Eccleshill Street, Padiham, Lancs. To carry on the bus. of packers and sellers of eggs, etc. Nom. Cap.: £100 in £1 shares.

H. HALSTEAD, LIMITED. (274521.) To take over the bus. of a grocer and provn. mcht. cd. on at 14 and 17, The Market Hall, Bury, and 247, Bury New Rd., Whitefield, Lancs. Nom. Cap.: £5,000 in £1 shares.

GEORGES DINNIS, LIMITED. (274520.) 82, Chapel Street, Islington, N. To take over the bus. of a grocer and genl. meat and provn. mcht. cd. on at Islington. Nom. Cap.: £3,000 in £1 shares.

NORAH COVE, LIMITED. (274533.) 66, Mount Street, W. 1. To carry on the bus. of biscuit mnfrs., etc. Nom. Cap.: £200 in £1 shares.

INTERNATIONAL COCOA CORPORATION, LIMITED. (274299.) To carry on the bus. of shippers of and agents for the sale and purchase of cocoa, coffee, tea, tobacco, etc. Nom. Cap.: £100 in 50 pref. shares of £1 and 500 ord. of 2s.

WALTER SMITH, LIMITED. (274363.) 51-55, Tib Street, Manchester. To take over the bus. of a dlr. in bird, dog, and poultry foods and appliances cd. on at Manchester. Nom. Cap.: £2,000 in £1 shares.

SEACROFT FISHERIES, LIMITED. (274189.) 101, Drummond Road, Skegness, Lincs. To take over the bus. of fish mchts. and fryers cd. on at Skegness by W. Turner and Sons. Nom. Cap.: £500 in £1 shares.

HOPKIN MORGAN, LIMITED. (274376.) To take over the bus. of a baker and confectioner cd. on at Pontypridd, Trealaw, and Cardiff, as "Hopkin Morgan." Nom. Cap. £60,000 in £1 shares.

KALOROIL BURNERS, LIMITED. (274277.) 4, Margravine Gardens, W. 6. To carry on the bus. of makers, producers, and inventors of apparatus for oil firing, etc. Nom. Cap.: £1,100 in £1 shares (100 ord. and 1,000 pref.).

KENT MUSHROOMS, LIMITED. (274302.) Station Approach, Chislehurst, Kent. To carry on the bus. of mushroom and fruit growers, etc. Nom. Cap.: £1,000 in £1 shares (900 pref. and 100 ord.).

BRISTOL BULK OIL STORAGE, LIMITED. (274746.) 18, Passage Street, St. Philip's Bridge, Bristol. To take over the bus. of oil storers and mchts. cd. on at Bristol and elsewhere. Nom. Cap.: £1,000 in £1 shares.

O.C.C. PRODUCTS, LIMITED. (274535.) Arundel Works, 34a, Deodar Road, Putney, S.W. 15. To carry on the bus. of mnfrs. of condiments, pickles, preserves, etc. Nom. Cap.: £100 in £1 shares.

G. M. SHARP, LIMITED. (274759.) 31, Midland Road, Bedford. To carry on the bus. of wholesale and retail fruit and vegetable mchts., etc. Nom. Cap.: £2,000 in £1 shares.

J. D. CLARK, LIMITED. (274767.) To carry on the bus. of fish curers and mchts., etc. Nom. Cap.: £1,000 in £1 shares (800 pref. and 200 ord.).

B. SMITH AND SONS (WEYMOUTH), LIMITED. (274323.) To take over the bus. of a baker and confectioner, etc., cd. on at 15, Abbotsbury Rd., Westham, Weymouth, as "B. Smith." Nom. Cap.: £1,500 in £1 shares (1,000 pref. and 500 ord.).

H. E. THORNLEY, LIMITED. (274417.) Radford Hall Brewery, Radford Semele, Warwickshire. To take over the bus. of brewers, etc., cd. on at Radford Semele, and elsewhere, as "H. E. Thornley." Nom. Cap.: £15,000 in £1 shares (5,000 "A" ord. and 10,000 "B" ord.).

The above-mentioned particulars of new companies recently registered have been extracted from the daily register of Messrs. Jordan and Sons, Ltd., company registration agents, Chancery Lane, W.C. 2.

Packing Soy Sauce Ready for Dispatch.

(Reproduced by courtesy of the Noda Shoyu Co., Ltd., Noda, Japan.)

TRADE NOTES

Bread Exhibition at Brussels.

We have been informed by the Belgian Embassy that the Institut International de la Boulangerie is holding its annual Bread Exhibition from now onwards to July 21. The address of the exhibition is 25, rue Major René Dubreucq, Bruxelles-Ixelles.

There are a number of international competitions being held for bread, biscuit, and pastry making. Technical and professional meetings are also arranged for those interested. During the whole period of the exhibition, visitors are allowed free entrance to the professional school of bread making, biscuit making, and pastry cooking, where demonstrations are given by specialists.

* * *

Lemonade and Ginger Beer.

We have received leaflets descriptive of their lemon and ginger beer extracts from Messrs. A. Boake, Roberts and Co., Ltd. "Truginger," a dry extract prepared from selected ginger root, is said to yield all the desirable features of a successful brew minus the objectionable starches, albuminoids, etc., which are liable to cause unpleasant odour and flavour, culminating in sourness. Mineral water manufacturers should also be interested in Messrs. Boake, Roberts' "Aero" heading, a widely used frothing agent.

Samples and recipes may be had on request to the makers.

* * *

Industrial Designs Competition, 1933.

Particulars of the Tenth Annual Open Competition of Industrial Designs, to be held at the Imperial College of Science and Technology, Imperial Institute Road, South Kensington, this month, have now been issued, and can be obtained from the Secretary of the Royal Society of Arts, John Street, Adelphi.

After the judging, which takes place in July, the prizes and accepted designs will be exhibited to the public at the Imperial Institute from August 5 to August 31 (Sundays included). In all, scholarships and prizes amounting to about £1,500 are offered in connection with the 1933 competition.

It is interesting to note among the prizes one of twenty guineas for a cut-out showcard to advertise Trex, offered by Messrs. J. Bibby and Sons, Ltd. In the Label Section, Messrs. Brown and Rawcliffe, Ltd., of Aintree, offer a prize of ten guineas for a label design for a can of English fruit or vegetables. For chocolate box designs, Messrs. Cadbury Brothers, Ltd., ofter three graded prizes: of £30, £15, and £5 respectively.

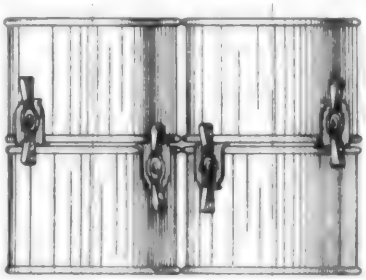
Change of Address.

The British Hydrological Corporation, Ltd., has now moved to High Path, Merton, S.W. 19. The new telephone numbers are Liberty 1021 and 1022. The nearest railway station for the delivery of goods is Merton Abbey, on the Southern Railway.

* * *

A New Can Opener.

The "Allop" can opener, now being introduced into this country, presents several features which should make it of definite interest to enterprising canneries. Apparently it obviates all possibility of damaging the pack, and is already widely employed on the Continent.



The chief novelty of the opener lies in the fact that it is fixed on and sold with each can. The consumer does not, therefore, have to start hunting for a can opener in order to get at the contents. It is there always, ready to function, and, what is more, to function easily and perfectly.

Briefly, it consists of a non-rusting stamping which has a knife edge bent over the rim of the can. On this main cutter stamping are fixed one or two small hard wheels which when fixed on the can engage the double seam and are operated by means of a small fly handle. The ends of the cans are slightly modified for the purpose by the incorporation of an easy, shallow recess to receive the cutter edge. We understand that the can ends thus modified to proper dimensions will shortly be obtainable from all the leading can manufacturers, and the canner will have no more to do in this respect than to specify when ordering.

A New Centrifugal Pump.

Messrs. Drysdale and Co., Ltd., the well-known makers of centrifugal pumps, have recently put on the market a novel design of centrifugal pump of the self-priming type, which is said to offer considerable advantages over the ordinary reciprocating pump so much in use at the present time.

This pump, known as the "Wee-Mac," works on an entirely new principle. The impeller is a plain disc with a number of blades arranged round the periphery, and rotates inside a concentric casing having a wedge-shaped passage on each side of the impeller. The wedge-shaped passage on one side gradually decreases in area from the suction opening where it is a maximum, while on the other side an opposite handed passage gradually widens until the discharge opening is reached. The water circulates in each of the blades itself, where it is given an impulse. The discharge into the pipe passages is taken up by the next cell and so on until the discharge orifice is reached. A compound pumping effect is therefore obtained, which is said to enable the pump to deliver at approximately three times the pressure of an ordinary centrifugal pump of the same proportions.

The "Wee-Mac" is self-priming, and, besides being able to fill an empty suction pipe, can also deal with air-locks due to loops or rising in the suction pipes without the slightest difficulty. The makers state that tests have proved the pump capable of working with a suction lift of 28 feet.

It is made in several different arrangements—*e.g.*, with direct coupled electric motor, with belt drive, and with direct coupled oil engine either for stationary or portable use. Various sizes, from 120 gallons per hour to 3,000 gallons per hour, and for pressures up to 150 lb. per sq. inch (equivalent to 346 feet head), may be supplied.

The pump is not an expensive one and its upkeep cost is said to be low—owing to the fact that it requires so little attention. The space it takes up is small and no foundations are necessary. Further particulars may be had on application to the manufacturers.

* * *

Baker Perkins Win Infringement Action.

An action of some importance to the chocolate manufacturing trade has recently been brought to a conclusion in the Danish Courts.

The plaintiffs were Baker Perkins, Ltd., of Willesden and Peterborough, and A. Savy Jeanjean et Cie, of Cour-

bevoie, Paris; the defendants the Danish firm of Bøggild and Jacobsen, of Copenhagen.

The action had reference to the rights of the plaintiffs under an agreement made by them with the defendants in 1927 whereby the associated British and French firms acquired exclusive rights to manufacture and sell the Jensen automatic plant for the continuous casting of chocolate.

In 1930 Bøggild and Jacobsen brought on to the market a competitive automatic plant for the continuous casting of chocolate, which, they now claimed, was not an infringement of the original design and did not, therefore, affect the British and French monopoly.

The trial of the action took place at Copenhagen in December last and judgment was entered for the plaintiffs. Costs were also awarded to the plaintiffs, and the matter of damages has recently been settled by negotiation It has been agreed, furthermore, that the exclusive rights of Baker Perkins, Ltd., and Savy Jeanjean et Cie shall extend to any continuous automatic plant for the casting of solid chocolate pieces, whether of pure chocolate or of chocolate paste mixed with other ingredients, and that Bøggild and Jacobsen are prohibited from any competition in this technical field, but that each party shall have the right to use the patents in continuous plants for the manufacture of chocolate goods other than solid chocolate. These exclusive rights are to extend to the whole of the world, except Scandinavian countries and the U.S.S.R., the Danish firm having exclusive rights for Scandinavia and joint rights for Russia.

* * *

English Flour Tests.

A statement has been received from the Ministry of Agriculture on the results of baking tests conducted by Mr. Quinn of the Technical College, Leeds, using All-English National Mark Wheat Flour and Malt Flour. The following recipe and method of working was found to be most suitable for tinned bread made from National Mark Yeoman Flour:

56 lb. of flour.
1 lb. of salt.
8 oz. All-English malt flour.
12 oz. of yeast.
11¼ quarts of water.

The process observed was as follows: A straight dough was kneaded in a mechanical mixer at 10.15 a.m., knocked back at 11, scaled and handed up at 11.50, tinned at 12.30, put in the oven at 1.15 and baked at 2 p.m. The temperature of the dough did not exceed 80° F.

The quality of all-English malt flour as an improver was, it is claimed, clearly demonstrated, and Mr. Quinn mentions that he has tried many improvers, but with the National Mark Yeoman Flour supplied to him, the best results were secured by the addition of an all-English malt flour.

Similar evidence that a good loaf can be obtained from National Mark Flour is furnished from the results of tests carried out by Mr. E. B. Bennion at the National School of Bakery, who reported that breadmaking tests with National Mark All-English Yeoman Flour made from 1932 crop wheat from 10 different sources proved the suitability of Yeoman flour for commercial breadmaking. Mr. Bennion advocates a four to five hour fermentation period, the avoidance of chilling during fermentation, and the use of fourteen and a half gallons of water per sack of flour.

It may not be generally known, the statement continues, that both National Mark wheat flour and malt flour possess certain standards of quality laid down in the regulations of the Ministry of Agriculture. Many bakers no doubt consider it of value to know the diastatic power or strength of the malt extract they use and would, therefore, derive benefit from using National Mark All-English malt flour and National Mark All-English (Bakers') malt extract which have a minimum diastatic activity or Lintner value of not less than 40 in the case of malt flours and malt extracts prepared for use with white bread. Such malt flours and malt extract are moreover excellent *natural* improvers.

Home-grown National Mark wheat flour and malt products have a sweet, nutty, characteristic flavour. Supplies can be obtained from many of the leading millers and malt product manufacturers, but in case of difficulty bakers can obtain lists of packers free of charge, on application to the Ministry of Agriculture and Fisheries.

Floors.

The advantages offered by steel plate flooring, bedded in concrete, are well set out in a leaflet recently issued by Langley (London), Ltd.

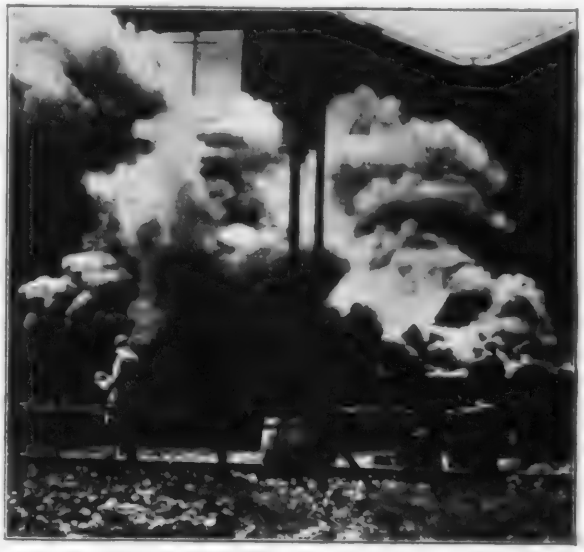
Continual repairs are often necessary to factory floors, and the consequent delay naturally means loss of time and money. "Sasp" (Stelcon Anchor Steel) floors are intended for heavy wear and are extremely durable. They are said to withstand excessive abrasion and heat, and when laid in accordance with instructions, are for all practical purposes immovable. A list of the people who use these floors in the various departments of their factories includes names of some of the largest manufacturing concerns in the country.

* * *

Roofs.

Cellactite, according to the makers, is a material designed and made specially to meet modern requirements for roofing and vertical cover. It is an imperishable compound of high grade asbestos and asphalt, consolidated by pressure with a steel core—so that the steel is permanently sealed from all corrosive influences—and finished in the form of standard corrugated sheets. It requires no painting or other protection, and is said to be permanent against corrosive atmosphere—industrial or otherwise—while tropic sun and arctic cold alike leave it unaffected.

Other advantages offered by this type of roofing are given, together with a variety of information, in *Cellactite Roofs and Vertical Cover*, copies of which are obtainable from Cellactite and British Uralite, Ltd.



The illustration shows H.R.H. Prince George watching a demonstration of extinguishing oil fire by water at the Manchester Works of Mather and Platt, Ltd. The Prince who, during his visit on May 10, was accompanied by the chairman, Mr. L. E. Mather, visited the pump, electrical, textile. fire, and food canning departments. He displayed keen interest in the variety of processes seen, and chatted with a number of employees.

INFORMATION and ADVICE

GRAVY POWDERS — JELLY CRYSTALS — PECTIN — LEMON CURD — ORANGE CURD — SPICES AND ESSENTIAL OILS — EGG SUBSTITUTES — SODIUM PYROPHOSPHATE — EMPTY TINS — CAROTIN EXTRACTION — LECITHIN — CANNING CORNED BEEF

Gravy Powders.

1,264. *We should be pleased to have recipes for gravy salt and gravy powder similar to well-known brands.* (London and Cheshire.)

We cannot, of course, undertake to supply recipes of products being marketed. As we have previously pointed out, it is quite a simple matter to secure the services of a food chemist to examine and analyse any particular sample which it is desired to match, and to instruct him to make up a product similar to the sample. If he is a good chemist and is given a little encouragement he will probably be able to make a better product than the sample. That is mainly why professional chemists exist. It is their job to improve on the existing condition of things, and any chemist worth his salt will in nine case out of ten, providing he is given the above-mentioned encouragement, succeed in doing it.

Gravy salt is, of course, salt coloured with caramel. It is a mixing problem to obtain a good, uniformly coloured product. It might be done in an iron steam-pan with stirring gear.

Gravy powders vary considerably in composition from a simple starch-salt-caramel mixture to more elaborate mixtures containing beef stock, garlic, onions, etc. Two important points are the choice of the starch (its nature, and degree and uniformity of fineness) and the methods employed in incorporating the colour (see enquiry *re* Jelly Crystals).

1,265. *We have a quantity of bones and also surplus rough fat which at present we are selling to soap manufacturers and also to chemical manure manufacturers at a very small price. We would if possible like to grind the bones for bone-meal and also deal with the fat if it can be made a paying position.*

What would a small plant cost us, so that we could turn out our own meal and also utilise the fat? Any suggestions would be appreciated. (Lincolnshire.)

Suggestions on the various points raised were offered.

1,266. *Please can you let us have a recipe for mayonnaise? We have a couple, but where one says the ingredients should be cooked, the other mentions no cooking. Also we should like to know whether only the yolk of egg should be used or the whole egg, and whether there is a fixed time for stirring all together.* (London.)

Please refer to the article on "Mayonnaise Manufacture" which appeared in our May issue. If after you have read this article there is any particular point you would like explained, we shall be pleased to do our best.

We might point out that in the manufacture of mayonnaise, the yolk of the egg only is used and no heating is carried out, but in the case of salad dressing and salad cream, the whole egg is used and the mixture is heated. Of course, in the case of salad cream, there is an addition of condensed milk.

1,267. *We should be greatly obliged if you would favour us with recipes for the making of salmon and similar fish pastes suitable for a high-class trade.* (Midlands.)

Reference was made to the information contained in the June and July, 1932, issues of FOOD MANUFACTURE. Further information will be forwarded if necessary.

1,268. *With reference to Enquiry 1,096 in a recent issue of* FOOD MANUFACTURE, *will you please state where the crude glutamate (for meat paste) can be obtained?* (Ireland.)

Information supplied.

1,269. *Please let us know the names of importers of almonds and all classes of nuts.* (Cheshire.)

This was done.

1,270. *I am interested in the following articles and request suppliers to send me prices, c.i.f. Progreso, samples, quantities to order as minimum, shipping conditions, etc.: Bicarbonate of soda, powdered. Acid calcium phosphate. Pyrophosphate of soda. Ultramarine blue. Tin in sheets various thicknesses.* (Mérida, Yucatán, Mexico.)

A selection of names was forwarded.

Jelly Crystals.

1,271. *Kindly supply recipes for sponge cake and jelly crystals.* (Ireland.)

As regards the first, a suggested formula was supplied. Jelly crystals have been dealt with in previous issues of this journal. The mixture is made from castor sugar, powdered gelatine, and tartaric acid in the proportions of roughly 20 : 5 : 1, together with suitable amounts of flavouring and colouring matter. The method of manipulation is all-important, especially the uniform incorporation of the flavour and colour. A flavoured and coloured base is first prepared which is mixed in one or two stages with the main batch. Care must be taken to have dry, finely sieved materials before mixing.

1,272. *I shall be glad if you can give me any further details of the flour improvers mentioned in your leading article in the April issue of* FOOD MANUFACTURE, *urea peroxide, and the milled seeds of ceratonia siliqua.*

Are there any manufacturers of either of these products in this country, and how can I obtain testing samples of either or both? (Kent.)

See answer to a similar enquiry given below.

1,273. *Could you give us details of the plant used in ice-cream manufacture and its approximate cost?* (County Limerick, Ireland.)

The enquirer was referred to various ice-cream plant manufacturers.

Pectin.

1,274. *I should be much obliged if you could refer me to the literature appertaining to the manufacture of pectin.* (Kent.)

A good summary with references is to be found in Morris' new book on *Principles of Fruit Preservation*. There are several methods in use. It is a good plan to consult the manufacturers of the plant. In very brief outline, one method consists in extracting pomace with water to remove sugar, etc., digesting the residue with about 1 per cent. tartaric or lactic acid for a couple of hours at about 3 atmospheres pressure, then filtering, cleaning with enzymes, followed by vacuum evaporation.

1,275. [*A correspondent asks several questions about fumigation with carbon dioxide-ethylene oxide mixture.*] (England.)

All the questions asked are adequately answered in the June, 1932, issue, which contains an article on the subject.

1,276. *Please send me addresses of millers making flaked wheat for human consumption.* (Bucks.)

We have been unable to find the names of any millers who do this. It is usually carried out by the makers of proprietary foods who use such flakes.

1,277. *We are desirous of obtaining a formula for the processing of cherries in brine to the stage called drained or glacé; in other words, to the stage where they are sold in tins or boxes for the bakers' trade.* (New Zealand.)

Reference was made to Mr. John Elsbury's article on the subject which appeared in our issue for September, 1932.

1,278. *I want to get in touch with suppliers of walnut waste, otherwise known as walnut vinegar.* (London.)

We do not know of any source of supply of walnut waste. If any reader can help we shall be obliged.

Lemon Curd.

1,279. *Can you suggest any remedy for mould in lemon curd?* (England.)

We have previously dealt with this matter. There are several points which are important. One is that the lemon curd must be filled at between 180° to 190° F. Another is that all utensils, jars, etc., which are used must be thoroughly dry and clean. A good plan is to wipe out the jars with a clean cloth which has been soaked in glycerin, or you might simply just wipe round the top edges of the jars. Also take care that the curd is stored in a dry, well ventilated, and clean place. It is advisable also that the wax circles should be wiped over with, or even dipped into, glycerin.

All this is assuming that your recipe is correct.

1,280. *Kindly give recipe for a savoury stuffing for pork to sell dry in packets.* (Oxon.)

Here is good scope for ingenuity. Try yourself, using as basic materials dried onions and sage, and rusks, flavoured with salt, pepper, and possibly thyme and lemon. It is an interesting job.

1,281. *I should be much obliged if you could give me information with as much detail as possible as to the processes involved in canning fresh peaches, nectarines, and apricots, or inform me where I can obtain such information. I am aware that these fruits are not canned in this country, being mostly a product of the United States.* (London.)

Various sources of information were indicated.

1,282. *Can you please give me addresses of makers (in this country) of jam-boiling pans and canning plants—small capacity?* (France.)

This was dealt with.

1,283. *Will you please put me in touch with enquirers 1,223 and 1,239, as I may possibly be of some practical assistance to them?* (Manchester.)

This was done.

Orange Curd.

1,284. *We shall be obliged for a recipe for orange curd.* (London.)

A suggested formula was supplied. Essentially the process consists in soaking overnight a mixture of wheat and corn flours in water. Next day, a batch of sugar, glucose, and water is brought to 245° F. and to it is added, through a sieve and stirring all the time, a mixture of sugar, pectin powder, and orange colour. As soon as this is dissolved, the flour paste is added after it has been mixed with orange juice. Then stir in butter and well beaten eggs. Bring the temperature gently up to 218° F. and hold for about ten minutes. Cool and fill into pots at about 180° to 190° F.

1,285. *I shall be glad if you can give me information as to where I can obtain formulæ for the manufacture of the following:* (a) *A cream suitable for mixture in vegetable salads. This cream, I understand, is different from the usual salad cream.* (b) *A piquant sauce (sweet-sour) similar to that used in the canning of Norwegian "gaffelbiters."* (London.)

We have a selection of stock recipes for salad creams and sauces, but are afraid that they give only general indications of the various lines to follow.

In sauce manufacture, success depends to a very large extent, not on the recipe, but on the method of manipulation, and it is only by securing the help of an experienced man that one can get really satisfactory results.

The services of a practical expert were therefore recommended.

1,286. *Can you inform us where we can obtain in this country small quantities of hydrogenated fish oil, neutral in flavour, white in colour, and with a melting-point of approximately 40° C.?* (Yorkshire.)

A likely source of supply was indicated.

1,287. *Will you kindly let us know the names of the enquirers under Nos. 1,124, 1,130, 1,141, and 1,144 in* FOOD MANUFACTURE *for March?* (Holland.)

These, with one exception, were given. The other we were particularly asked not to disclose.

1,288. *Further to our telephone call of this afternoon in connection with an enquiry we have received from Australia, we shall be very glad if you can furnish us with the names of firms manufacturing the machines enumerated below: Machinery for packing 4-oz. packets of jelly crystals; machinery for making junket tablets; machinery for packing culinary essences.*

Whatever information you can give us in respect of the above will be greatly appreciated. (London.)

Information supplied.

Spices and Essential Oils.

1,289. *Would you kindly let us know the proportion of essential oil to use for pork sausages equivalent to the following: 14 lb. white pepper; 12 oz. mace; 8 oz. nutmegs; 8oz. ginger; 1 oz. cayenne?* (Wilts.)

The amounts of oils obtainable from various spices vary with the particular crop, etc., so an average percentage is taken in each case—*e.g.*, pepper 1 per cent., mace 3½ per cent., and so on. Based on these averages, the flavouring recipe comes out as follows (proportions by weight): 84 oil pepper; 21 oil mace; 20 oil nutmeg; 1 oil ginger.

Cayenne is included in the pepper, as we are not aware that cayenne oil is marketed.

Bearing in mind the point that the spice oil yields are based on averages, you may find it necessary to vary the above proportions slightly. Furthermore, as these oils are extremely strong, it may be advisable for you to experiment under skilled supervision, with emulsions instead of the neat oils.

1,290. [*A reader is not satisfied with his ice-cream powder and asks us to improve on it. He is using as part of his mixture a proprietary powder.* (Ireland.)

The only satisfactory way is to supply a sample of the proprietary powder together with full details of the amounts of other ingredients used, so that an analysis followed by tests can be carried out.

1,291. *As we are considering the repacking of our products we should be glad if you would give us the names of various manufacturers of tins and cardboard or paper cartons.* (Gloucester.)

Names were given.

1,292. *We have a foreign enquiry which reads as follows: "I am interested in the preparation of jams from plantain fruits."*

Can you put us in touch with the publishers of any literature bearing on the manufacture of jams from plantain fruits, and is there any special machinery for mass-production? Any information which you can give us on this class of jam manufacture will be appreciated. (London.)

Some information on banana jam was supplied, and the enquirer put in touch with plant manufacturers.

1,293. *With reference to Enquiry No. 1,028 in* FOOD MANUFACTURE *of January, 1933, we shall be glad to know*

the name of the "suitable British substitute," with the maker's name and address.

Also please supply the names of firms making machines (whole process automatic) for weighing and wrapping ounce packets of Epsom salts. (India.)

Information supplied.

1,294. *We have an enquiry from overseas for the following food machinery: Hobart machine; Berkel slicing machine; vegetable paring machine.*

We should esteem it a favour if you would apprise us of the names and addresses of the manufacturers of these machines, if known to you. (London.)

Names and addresses supplied.

1,295. *We shall be glad if you can put us in touch with a manufacturer of paste for fixing labels on to unlacquered tins which can be guaranteed absolutely to prevent rust spots occurring under the label.* (London.)

This was done.

Egg Substitutes.

1,296. *I would like any information you may have on the manufacture of egg substitutes.* (Australia.)

We are not clear as to what type of egg substitute you refer to. With frozen egg pulp now on the English market at a very low price, it is questionable whether you can produce anything competitive. We take it that you are not referring to ordinary custard powders, which largely consist of a mixture of sago flour and cornflour, or various other flours, suitably coloured and flavoured.

Blyth and Cox state that egg substitutes are usually found on analysis to be merely baking powder to which a suitable dyestuff has been added to make it resemble eggs. Other egg substitutes in use are commercial albumin, casein, gluten, gelatin, and isinglass. Then there are the "egg powders" referred to by Blyth and Cox which, according to Tibbles, consist chiefly of starch with an aerating substance such as tartaric acid and bicarbonate of soda. Some of them contain gelatin, casein, gum, or dextrin. Tibbles says the following is fairly representative of their composition:

Tartaric acid	10·45 per cent.
Sodium bicarbonate	21·30 ,, ,,
Starch	51·25 ,, ,,
Albumin	6·50 ,, ,,
Water	10·50 ,, ,,

1,297. *I would esteem it a great favour if you would forward me particulars of a process for making first-class potato crisps; also the addresses of firms supplying the necessary equipment.* (Midlands.)

A good deal of information regarding potato crisps was published in our February, 1933, issue. Information regarding suppliers of equipment was forwarded.

1,298. *I wish to obtain a book dealing with the bitter orange.* (Alsace.)

We cannot deal with this enquiry until we know whether reference is made to the tree, fruit, oils, or uses of the bitter orange.

1,299. *We require some information with regard to edible waxes and hard fats. Please say if there is any book published giving a list of waxes and fats suitable for use in foodstuffs, together with the distinguishing features of each product.* (Yorkshire.)

Suitable literature was recommended.

1,300. *We shall be much obliged to you if you can give us the names of the following firms, April issue, 1933, enquirers:* 1,167, 1,168, 1,169, 1,172, 1,189, 1,192, 1,210, 1,206.

Information supplied.

1301. *We are interested in machines for manufacturing cartons for ice-cream and also a machine for making small tin boxes, and shall be glad to learn whether you can suggest some names and addresses of manufacturers.* (London.)

Suggestions were made.

1,302. *We are requiring some 50-gallon containers with screw top and tap, and are of the opinion that we have noticed some firm advertising in your journal. Your information will be gratefully accepted.* (Lancashire.)

Information supplied.

Sodium Pyrophosphate.

1,303. *Can you give me a method of manufacturing acid pyrophosphate of sodium?* (London.)

We cannot go into the manufacturing details, as these depend, as you will realise, on a number of considerations, such as extent of output, amount of money intended to be spent on equipment, and so on. For this you will require the services of a consulting engineer to estimate for you.

Speaking in a general way, sodium acid pyrophosphate is manufactured by heating mono-sodium phosphate to temperatures between 225° and 250° C. for six to twelve hours. One of the important points is to see that 250° is not exceeded, otherwise a further loss of water results in the formation of sodium meta-phosphate.

Mono-sodium phosphate is manufactured on similar lines to those employed for the manufacture of mono-calcium phosphate.

A fair description of the methods employed in the manufacture of the phosphate materials used in baking powders is given in the book entitled *Phosphoric Acid, Phosphates, and Phosphatic Fertilisers*, by Waggaman.

The raw materials one would start with, in the ordinary way at any rate, are phosphoric acid and a sodium salt, such as sodium carbonate.

Mixing takes place in a mechanical mixing pan, and care should be taken to see that there is no free phosphoric acid left over in the product, as this would introduce difficulties in subsequent drying. Stirring is continued until the mass sets up. The material is then removed from the mixer and spread out on the floor for drying. The lumping material is vacuum dried; this is a matter which requires considerable care. After drying, the material is milled and ground.

1,304. *On page 112 of the April edition there is a paragraph headed "Self-Raising Flour." Where can I obtain further information on the paragraph "oxygen or hydrogen peroxide is available as a gluten improver"? Where can I obtain the "seeds of ceratonia siliqua"?* (London.)

The enquirer was advised to get in touch with Tres Chemisch Pharmazeutische Industrie and Handels, A.-G., Ullio-ut 42, Budapest 8, Hungary, who are the proprietors of both the patents covering the hydrogen peroxide and ceratonia siliqua methods of flour improvement.

Since these processes have been patented, it will be necessary for him to get in touch with the firm whose name is given above, should he wish to make use of the methods himself.

1,305. *Could you assist us with recipes for piping jelly with (1) pectin, (2) agar-agar, (3) gelatine bases?*

We should much appreciate your help in this matter. (London.)

Attention was drawn to various FOOD MANUFACTURE recipes. If these are not sufficient, further information will be forwarded.

1,306. *We require: (1) Description of oil used in dressing whole rice for the grocery trade. (2) Source of supply. (3) Names and addresses of makers of machinery used for oil-dressing rice.* (Hull.)

This enquiry was passed on to the right quarter.

1,307. *Can you kindly supply us with a recipe for mustard sauce, together with information regarding its preparation and packaging?* (Midlands.)

This being too big a matter to deal with in the ordinary course of correspondence, we have put the enquirer in touch with a practical expert.

Empty Tins.

1,308. *We use a large number of tins of fruit. Can you inform us of any firms prepared to buy the empty tins? Alternatively, what is the best way of disposing of these tins?* (Bristol.)

We are afraid that we do not know of any remunerative way of using empty tins at the present price of steel scrap. Some years ago they were pressed and sold for the purpose of detinning, and up to 1928, we are informed, there was quite a business in the United States. We have been told that a firm in Wandsworth used to do this work, but they have given it up, so no doubt old tins are not being collected by scrap merchants to-day.

Carotin Extraction.

1,309. *In the present edition of the "Food Industries Manual," page 5, you mention in the paragraph dealing with Extraction of Carotin, that Pratt's aviation spirit should be used. Could you please inform me if there is any special reason why Pratt's should be used?* (London.)

Kent-Jones in his book *Modern Cereal Chemistry* makes reference to Pratt's aviation spirit. We presume he mentions this so that other people repeating his method will use the same type of spirit. A well-known authority informs us that he always extracts carotin with petroleum ether 40 to 60 B.P., which is more uniform than any commercial spirit can be.

1,310. *Can you give me names of British engineers producing plant for the manufacture of tomato juice, tomato purée or pulp, tomato ketchup or sauce? Some friends of mine are requiring complete plant.* (London.)

Names were given.

1,311. *Please put us in touch with reliable books on gelatine manufacture.* (Copenhagen.)

This was done.

1,312. *Will you be good enough to let us have the names of makers of the granulating rusk plant referred to in Enquiry No. 886 of the October issue, 1932?* (Ireland.)

Information forwarded.

Lecithin.

1,313. *We should be glad to have information concerning the uses of lecithin.* (U.S.A.)

We have had an article in this journal concerning the application of lecithin to chocolate manufacture, and at different times notes have been given on its other uses. Shortly we hope to publish a really comprehensive article on the subject giving the latest information available. In the meantime, we suggest you get in touch with Mr. R. H. Morgan, who has probably carried out more investigations into the properties and commercial application of lecithin than anyone in this country. We would also refer you to literature issued by A. Boake, Roberts and Co., Ltd., and Fredk. Boehm, Ltd.

As an emulsifier, lecithin is continually finding new uses, and some important work has lately been carried out in this connection. It is being used to advantage in the manufacture of chocolate (economising the cocoa-butter and inhibiting fat bloom), caramels, toffee, fudge, nougats, sponge and other cakes, bread, and an increasing number of other products.

1,314. *As a constant reader of* FOOD MANUFACTURE *since it commenced publication, I should be glad to know where I could obtain a wafer pan or iron for the hand preparation of wafers in small experimental lots.* (Singapore.)

Information supplied.

1,315. *I would feel very much obliged to you if you would put me in touch with manufacturers of adhesive cement in powder form, which can be kept for a certain length of time and prepared at any time into a paste for labelling bottles at a machine.* (Habana.)

Names and addresses of suppliers were forwarded.

Canning Corned Beef.

1,316. *We should be grateful for a recipe for canning corned beef under the quick cure method.* (Ireland.)

The quick cure method is given by the *Packers' Encyclopædia* as follows:

Depending upon the quality the beef to be corned should be cooked for six hours at 158° F. The same kettles used for cooking may be used for curing. After cooking, the soup should be drained off and 25° pickle, containing the maximum amount of saltpetre or nitrate of soda used in any pickle, should be added, the temperature of same being 140° F. It is important to use 70 per cent. of second pickle, and only 30 per cent. of new pickle. Little or no sugar in the formula is required.

Pickling will require six hours, during which time the product should be constantly agitated. The temperature should be down to about 120° F. at the end of that period.

After curing, the beef is cut into pieces, put in cans, and covered with juice composed of one-half bouillon in which the beef has been boiled and one-half bouillon from calves' feet. The latter may be flavoured with laurel cloves and a little nutmeg. Processing should take place as follows: 3-lb. cans, 240° F., 3¼ hours; 2-lb. cans, 240° F., 2¾ hours; 1-lb. cans, 240° F., 1¼ hours.

Depending on the class of trade and other controlling factors, each canner has prepared various formulas and spicing methods.

1,317. *Would it be troubling you too much to let us have the dates of exhibitions of every kind during the next twelve months?*

If you cannot give us this information, perhaps you will kindly let us know to whom we could write to get it from. We enclose herewith stamped addressed envelope for your reply. (Gloucester.)

The enquirer was referred to the Board of Trade.

1,318. *We should be very glad if you would kindly let us have the names and addresses of makers of glass bottles with screw tops, suitable for containing medicinal powder.* (Burton-on-Trent.)

Information supplied.

1,319. *We wish to have the minimum amount of water in the butter we manufacture. Will you please suggest the best practicable way?* (Bombay.)

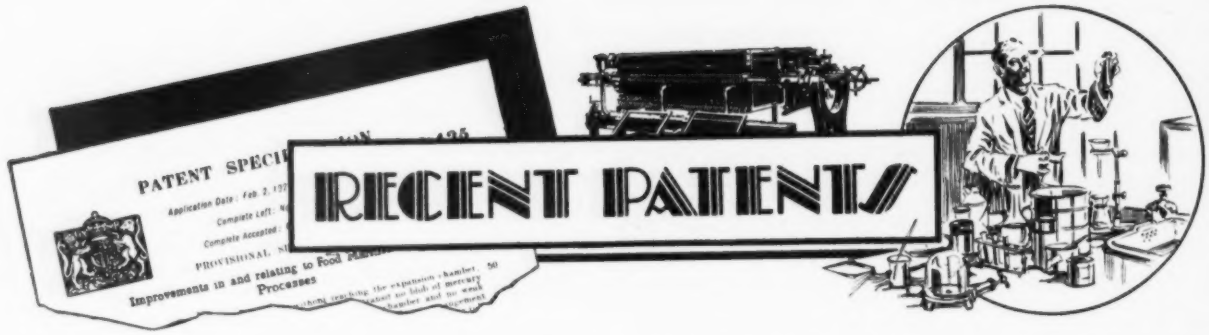
This matter was passed into the hands of a consultant, as it requires expert attention.

MILK AND CREAM BACTERIOLOGY

BULLETIN No. 257, issued in December, 1931, by the Department of Agriculture and Markets of the State of New York, gives a useful account of the determination of bacteria in milk and cream purchased, on the basis of bacterial count, with law and recommended procedure.

CANNERS' CONVENTION

THE Annual Canners' Convention will be held in the first week of November next during the course of the Canners' and Allied Trades' Exhibition, which opens in conjunction with the Imperial Fruit Show at the Coliseum, Bristol, on Oct. 27. Particulars may be obtained from the National Food Canning Council, 12, Whitehall, London, S.W. 1.



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Latest Patent Applications

11844. CLIFFORD, W. E.: Treatment of coffee. April 24.

10683. ANNACKER, J. P., and STEWART, J. E.: Apparatus for preservation of foodstuffs, etc. April 10.

11097. ALUMINIUM PLANT AND VESSEL CO., LTD., and STANLEY, E.: Presses for extracting fruit juice, etc. April 13.

10811. CRANE, P. E.: Food products, and manufacture of same. April 11.

10872. PETITJEAN, R.: Fruit presses. April 11.

10873. PETITJEAN, R.: Fruit presses. April 11. (Cognate with 10872.)

Specifications Published

391,256. NIERINCK, F.: Method and apparatus for preserving foodstuffs

390,382. HIDDE (*née* STIRNEMANN), E.: Means and method of preserving fruits and other food and delicacies, and other easily perishable substances of all kinds.

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

Abstracts Published

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per group volume, or in bound volumes price 2s. each.

387,493. **Flavouring materials for food.** MIYASHITA, K., 1666, Tobata, and YAMASHITA, U., 5446, Tobata, Tobata-shi, Japan. Fish is deodorised by deviscerating, immersing in water in a vessel of electrically conducting material and supplying a continuous current between a negative electrode, which is dipped in the water, and the vessel, esters of unsaturated fatty acids and other undesirable constituents being removed and deposited on the electrode. Mackerel is boiled and treated in a copper vessel using a copper electrode, for about 20 minutes with a current of 70 volts and 10 amps., and may be then dried and powdered for use as a flavouring material. Specification 7843/02 (Class 49, Food, etc.) is referred to.

388,453. **Preserving meat, sausage, etc.** GMYREK, K., 8, Ring Gleiwitz, Upper Silesia, Germany.
Sliced meat, sausage, etc., is enclosed in a cardboard or like container having a window of flexible transparent material, the air is replaced by carbon dioxide, and the container is sealed by strips of cellulosic material in an atmosphere of carbon dioxide.

387,294. **Food preparations.** TURNER, A. C., 206, West Madison Avenue, Riversdale, Maryland, U.S.A.
A food composition which can be packed without deterioration for use in preparing a fruit duff is obtained by mixing the fat to dryness with a portion of the flour, mixing the fruit, together with the seasoning, if desired, with another portion of the flour so that the fruit particles are coated therewith, and then combining the two portions in a homogeneous admixture. Preferably the seasoning and other ingredients are added after mixing with a third portion of the flour.

Recent Trade Marks

This list of Trade Marks of interest to readers has been selected from the "Official Trade Marks Journal," and is published by permission of the Controller of H.M. Stationery Office. The "Trade Marks Journal" can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

GLOMINTS.—535,753. **Confectionery and sweetmeats, all made of, or containing, mint.** FRYER AND COMPANY (NELSON), LIMITED, Victory Factories, Chapel Street, Nelson, Lancashire. Feb. 22. (Associated.)

DIATA.—537,223. **Coffee.** ALFRED KASPER, trading as Quieta-Werke Alfred Kasper, 5, Wittenberger Strasse, Leipzig, C. 1. Germany. Feb. 22.

THERMONADE.—538,242. **Beverages, not alcoholic, not medicated, and not aerated.** R. J. ANDERSON AND SONS, LIMITED, 188, Perth Road, Dundee, Scotland. Feb. 22.

SUNRAY.—538,288. **Salt (for food).** R. S. DYSON AND COMPANY, LIMITED, Colonial Buildings, Peterson Road, Wakefield, Yorkshire. Feb. 22.

LADY GAY.—538,651. **Chocolate and confectionery.** J. LYONS AND CO., LIMITED, Cadby Hall, Hammersmith Road, Kensington, London, W. 14. Feb. 22.

HENDEES.—538,681. **Bread and flour confections.** HENDERSON AND SONS, LIMITED, The Electric Bakery, Oak Street, Gateshead-on-Tyne. Feb. 22.

HONEYDEW.—534,676. **Melons.** JOSE SANCHEZMINGUEZ, 82, Lavington Road, London, W. 13. Feb. 15. User claimed from September 3, 1922, Section 21.

DEXOMINTS.—536,967. **Peppermint confectionery.** A. S. WILKIN, LIMITED, Cremona Park, Benton Road, Newcastle-on-Tyne. Feb. 15. (By Consent.)

VIVER.—537,008. **Confectionery.** J. N. NICHOLS AND CO., LTD., Britannic Works, Ayres Road, Brook's Bar, Manchester. Feb. 15. (By Consent.)

THISTLE.—537,496. **Lemon squash and orange squash.** L. ROSE AND CO., LIMITED, 89, Worship Street, London, E.C. 2. Feb. 15.

TETSILON.—537,591. **Ceylon tea.** TETLEY AND WHITLEY, LIMITED, 56, Bloom Street, Manchester. Feb. 15. (By Consent.)

PORTHOLE.—537,946. **Confectionery.** JAMES PASCALL, LIMITED, Furzedown Works, Streatham Road, Mitcham, Surrey. Feb 15.

CONGRESS.—538,200. **Biscuits.** BEE BEE BISCUITS, LIMITED, Sutherland Road, Blackpool. Feb. 15.